SCIENCE.

FRIDAY, DECEMBER 10, 1886.

COMMENT AND CRITICISM.

THE OBLIGATIONS and the rights of physicians throughout the state of New York are matters of such importance that we propose to give those extracts from the laws which bear upon the question of registration, and also such opinions as have come to our notice under the law. This matter is being critically examined by very many practitioners, and it is a subject about which there should be no doubt: if any exists, the legislature should, at its coming session, enact such a law as will not be subject to the different interpretations which seem to have been given to the present law. The law under which physicians register is chapter 513 of the laws of 1880. Section 2 of the law reads as follows: "Every person now lawfully engaged in the practice of physic and surgery within the state shall, on or before the first day of October, eighteen hundred and eighty, and every person hereafter duly authorized to practise physic and surgery, shall, before commencing to practise, register in the clerk's office of the county where he is practising, or intends to commence the practice of physic and surgery, in a book to be kept by said clerk, his name, residence, and place of birth, together with his authority for so practising physic and surgery as prescribed in this act." Very many physicians neglected to register before the 1st of October, and in the following year another act was passed, and is chapter 186, laws of 1881. The section bearing on the point in question (section 1) is as follows: "Any person who was duly authorized to practise physic . . . and who shall not have registered as required by the provision of said chapter (513, laws of 1880) shall have until the first day of October, eighteen hundred and eighty-one, in which to register as prescribed by section two of said act, entitled 'An act,' etc."

Several questions have arisen since these laws were enacted, among others the following: can a physician register who is a graduate of one of the medical colleges of the state, but who was out of the state at the time these acts were passed, and did not return until after the 1st of October, 1881? The following case occurred in Brooklyn, and practically answers the question in the affirmative. The papers referring to it and the other cases mentioned hereafter are in the office of the clerk of Kings county, and the substance of them only is here given. Willis E. Crowell received a diploma in June, 1874, from the New York eclectic medical college, authorizing him to practise medicine. He subsequently left the state, being absent five years, and was not within the state to register in compliance with the law of 1880. In 1883 he applied to the clerk of Kings county for registration, but was refused. On Feb. 1, 1883, Hon. Charles F. Brown, justice of the supreme court, ordered the clerk to register his name. A similar case occurred in Brooklyn in 1885, in which the county clerk refused to register Horace B. Ransom, who had a diploma from the University of the city of New York, granted in 1857. Dr. Ransom had soon thereafter gone to Burlington, Io., not returning until 1885. Upon presentation of the facts to the Hon. E. M. Cullen, justice of the supreme court, he ordered the clerk to register him. The order is dated April 22, 1885. In January, 1886, Ashbel P. Grinnell applied to the clerk of Kings county to be registered, and was refused. The facts in the case were these: Dr. Grinnell received his diploma from Bellevue hospital medical college in March, 1869; afterwards he moved to the state of Vermont, where he resided until Jan. 1, 1886, when he again came within the state. In reference to this case, Hon. E. M. Cullen, justice of the supreme court, said, "I think, on making the affidavit or exhibiting the diploma or certificate, a physician is entitled to be registered at any time. The first of October, 1881, mentioned in the act, does not limit the time within which physicians can be registered, but any physician practising after that time without registering is guilty of an offence." It would appear from this latter case to be the opinion of Justice Cullen that a physician not only can register at any time, but must do so, even though he neglected to do so prior to Oct. 1, 1881, and that if he fails to do so he 'is guilty of an offence.' Until this decision was made, a considerable number of physicians had applied to be registered, who had,

through neglect or absence from the state, failed to register before October, 1881, and whose subsequent application had been refused. Some of these are still unregistered, not aware of the fact that Justice Cullen has decided not only that they have the right to register, but that it is their duty to do so. If this statement comes to the knowledge of any such, they should at once apply for registration.

Another question has arisen in connection with the registration law, and that is, must a physician who has registered in one county of the state, if he desires to practise in another county, re-register in that county? We simply desire to have appear what the views of the two justices are on this question. Until the case comes before them in such shape that a judicial opinion in the strictly legal sense can be given, we do not know how their views could be better expressed. In the last number of *Science* (viii. No. 200, p. 515), we stated these views as those of Justices Cullen and Bartlett. We should have said Justices Bartlett and Brown. The entry in the county clerk's book is as follows: "Dr. John Smith registered as a physician in Greene county in 1880, in compliance with chapter 513, laws of 1880. Dr. Smith afterwards, on the 13th of March, 1885, applied to the county clerk of Kings county to be again registered; but the county clerk of Kings county refused to register him. The matter was brought before Judges Bartlett and Brown, who decided orally that Dr. Smith was not obliged to register in every county of the state." The deputy informs us that at the time one of the justices remarked that "it was absurd to suppose that a physician must register in the sixty counties of the state if he wanted to practise in them all." In view of all these facts, perhaps it would have been more exact if, instead of saying that re-registration was absurd as a matter of law, we had said that it was absurd as looked upon by a supreme court judge. That these views are not held by other judges appears from the letters of the counsel to the medical society.

We have received a reprint of an article by Dr. Crothers of Hartford, which was printed recently in the *Alienist and neurologist*. It is entitled 'Certain hereditary and psychical phenomena in inebriety,' and contains some facts which are of great interest not only to students of psychological heredity, but to those taking part in the social and political arguments on the liquor-question. Dr. Crothers has found two sorts of instances of inheritance of the symptoms of inebriety, — one in which the symptoms of intoxication are present all the time; the other in which these symptoms only appear from some peculiar circumstance or exciting cause. In the first class some prominent defect, such as idiocy, imbecility, and congenital deformity, is present, and gives the case a distinctness irrespective of the signs of intoxication. These symptoms may appear after birth, or be slowly evolved with the growth of the child, coming into prominence at or before puberty. Among other instances, Dr. Crothers cites this one: "In the home of a former patient I found a little girl, an idiot, whose voice and rambling utterance, with intensely red eyes and drunken expression, pointed back to causes and conditions that had not been noticed before. Other defects and deformities of the face and body cover up these peculiar signs of intoxication."

The second class of cases is less common, but the symptoms are very distinct. Unlike the first class, here the persons affected possess average brain-power, and in many instances are men of positive force. They are usually temperate men, never using alcohol, yet under certain circumstances they act and appear as if intoxicated. In these cases some sort of mental shock takes place that destroys the balance and brings uppermost an inherited neurotic effect. These cases come from inebriate parents or moderate drinkers, and they have inherited some defective nerve-organization which thus manifests itself. Dr. Crothers cites this instance: "A merchant, in good health, and temperate, while at work in his counting-room, received a despatch of the death of his daughter. He lay down on a sofa in his office, and very soon became wildly intoxicated. A physician made this diagnosis, although there was no odor of alcohol in the breath. He was taken home, and remained in bed a week. Two opinions prevailed, — one, that he had drunk in his office; the other, that it was congestion of the brain. He denied having used spirits, but was confused about the events of the past. In this case an heredity from alcoholic ancestors was present."

Then there are cases of persons who have been inebriates or intoxicated, and have since become total abstainers, but from unknown causes sud-

denly manifest all the signs of intoxication. Dr. Crothers concludes, 1°, that symptoms of alcoholic poisoning cannot be trusted as evidence of the immediate use of alcohol; 2°, that the excessive use of alcohol leaves a permanent defect or impress on the brain, which will go down into the future with great certainty. The author says that he presents these facts as a sort of preliminary survey of a comparatively unknown field. The subject is of so great and so far-reaching interest, that we trust the survey will be speedily pushed to completion.

AT THE LAST GENERAL MEETING of the English society for psychical research there was some discussion over Mr. Myers's paper on multiplex personality, which was published in the *Nineteenth century* for November, and an extended account was given by Mr. Myers of some observations made by Mr. Gurney, Dr. A. T. Myers, and himself at a meeting in Paris of the Société de psychologie physiologique. At their conclusion, Prof. Henry Sidgwick, who was occupying the chair, made some remarks on the general subject of psychical research, which, both because of their import and the distinguished reputation of the speaker, will undoubtedly carry much weight and attract very general attention among scientific men. Professor Sidgwick said that the society for psychical research had now reached an important crisis. The work prepared by Messrs. Gurney, Myers, and Podmore, entitled 'Phantasms of the living,' — of which we will give our readers an extended notice shortly, — was about to be put in the hands of the public; and for the first time the scientific world would have before it in complete form the grounds for the 'momentous conclusion' announced some time ago by the authors of the book, and in which he (Professor Sidgwick) *was entirely disposed to concur*, — the italics are our own, — that the mental state of one person might affect another otherwise than through the recognized channels of communication by the senses, and even at a distance so great as to render a physical mode of communication very difficult to conceive.

Were this result to be generally accepted by scientists, Professor Sidgwick continued, even those now most opposed to psychical research would admit the great importance of the achievements. However, he did not anticipate any such sudden conquest of the scientific world, though he thought that this failure to convince would result only from paying no attention to either the evidence or the reasoning of the authors of 'Phantasms of the living.' Undoubtedly some, not a few perhaps, would read the book and remain unconvinced. Professor Sidgwick cited as ground for this expectation the "thoughtful and instructive address of Prof. Simon Newcomb, president of the American society for psychical research, published last summer. Professor Newcomb had undoubtedly given serious and candid attention to the subject before pronouncing the discouraging opinion that the work of his society had "almost entirely removed any ground which might have existed for believing thought-transferrence a reality." While welcoming this candid criticism from Professor Newcomb and others, Professor Sidgwick could not accept it as valid, for it mainly rested on the fact that the English society had constructed no theory of thought-transferrence.

To this Professor Sidgwick answered, and we think his answer fully meets the objection, that the establishment of the fact of thought-transferrence, and the framing a theory to account for and explain that fact, are two very different things. The one cannot be legitimately rejected because the other is not immediately forthcoming. Still the crucial point is to exclude, in the experiments, all communications through the recognized channels of sense; and Professor Sidgwick expressed the hope that Professor Newcomb, and any others who shared his opinion, would indicate exactly how, in their view, the experiments could be made more conclusive. Professor Sidgwick's entire address was calm and judicial, and his avowal of his belief in the possibility of thought-transferrence, while guarded, is a serious blow to those who have been doubting the value of the very carefully and conscientiously conducted investigations and experiments of the English society for psychical research.

THAT PASTEUR'S VIEWS are not accepted by all was shown by the criticism passed upon his recent report which was read at the Academy of sciences, and to which our Paris letter alludes in this number of *Science*. In Pasteur's report there were included 1,700 French who have been inoculated for rabies. M. Colin, a veterinary surgeon, takes

exception to these figures. He thinks that a very large number of dogs that have bitten people, and supposed to be rabid, were not rabid, and points out several other possible errors in Pasteur's deductions.

THE UNSEEMLY WRANGLE that has been caused by the *Quarterly review* article on Mr. Edward Gosse has greatly excited the literary men at the universities. Whatever be the merits of the case, from this distance we can only see that the whole proceeding is derogatory to the dignity of men of literary reputation and culture. Journalistic quarrels are usually of no benefit and questionable taste, but it would be bad indeed if the outcome of this one should be, as one English critic insinuates, to prove that at one university is a professor who is not a scholar, and at the other, one who is not a gentleman.

THE AMERICANISTS.

THE sixth session of the Congress international des Americanists was held in September last at Turin. It may not be amiss to say that the previous meetings were held at Nancy (1873), Luxemburg (1877), Brussels (1879), Madrid (1881), and Copenhagen (1883). The sixth session would have been held last year had not the cholera prevented. The congress held its meetings in the old chamber in the Carignan palace, where the deputies of the Sardinian kingdom held their meeting, while the capital of that kingdom remained at Turin. M. Desiré Charnay opened the real business of the meeting with an address complaining that too little attention was given in Europe to the study of American history, and too much to that of the east. "Why," said he, "men care more for the discovery of a finger of Venus or a toe of Mercury than they do for the finding of a whole city in America." He instanced especially the apathy with which Maudslay's work was received in England, saying that it took the directors of the Kensington museum three months to make up their minds as to whether they would accept a monolith as a gift.

The first discussion arose on a paper read by M. Guido Cora on the Zeni Brothers. The speaker delared that the well-known map which goes under the name of the Zeni map was the best authority in the case. He recognized the Faroe Islands in Frislanda; Iceland in Islanda; Greenland in Engronelant; and portions of North America in Estotiland and Drogeo. M. Beauvois thought that the Zeni explored Newfoundland, while M. V. Schmidt argued that Engronelant corresponded to the modern Angramanlant and Norway.

M. Jiminez followed with a very long and detailed communication on the migrations of the Carib race. In his opinion, that movement was by the Amazon and Orinoco rivers. Then M. le Baron de Baye presented a note by the Marquis of Monclar with regard to a trepanned skull from the upper basin of the Amazon, and M. Pigorini a memoir of M. Strobel upon picture-writing of South America. M. Grossi finally read a paper upon coins of the old and new worlds.

The next day M. Schmidt presented, in behalf of Dr. H. Rink, a paper describing the Eskimo tribes of the extreme west and east. He gave very detailed statements of the manners, customs, houses, dress, social order, myths, and traditions of those tribes. Dr. Rink agrees with Captain Hohn, that the Eskimos have occupied the coasts of Greenland on all sides.

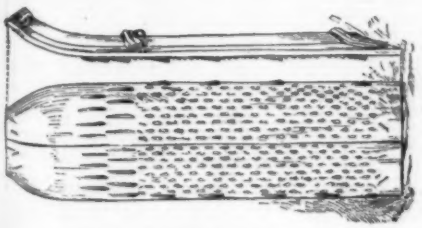
A description, purporting to have come from Mr. A. S. Gatschet of the ethnological bureau at Washington, of the Maya dictionary, was then read. Without doubt it is of the greatest importance in the study of this ancient language, and the deciphering of the old inscriptions in that language. The dictionary, or rather vocabulary, forms part of the Carter-Brown library in Providence. The dictionary is in two parts, each forming a small quarto volume. Part i. contains the Maya-Spanish part; part ii., the Spanish-Maya part. It was probably composed between 1590 and 1600. It is named after the monastery where the author lived, Motul. The author is unknown, and the copy in question is not the original manuscript, but a copy. According to a somewhat minute calculation, it was estimated that the volume contained about 15,400 terms. Others have thought the number higher. It gives us the Maya tongue as it existed at the time or shortly after the conquest. A vote was passed asking the government of the United States to publish the dictionary at its own expense. The congress soon after adjourned, after providing for another meeting at Berlin in 1888.

ARCHEOLOGICAL ENIGMAS.

THE meeting of the Anthropological society of Washington on Nov. 16 was devoted to the reading of two papers bearing on the antiquity of man in America. Mr. G. K. Gilbert, chief geologist of the U. S. geological survey, described minutely the finding of an ancient hearth on the southern shore of Lake Ontario, at the bottom of a well about thirty feet deep. The formation at the base of which the hearth was discovered is one of a

series of shore-deposits left by the receding ice of the last glacial epoch. Mr. Gilbert described minutely the manner in which these old beaches were built up by moving gravel one after another by a series of inverted imbrications or overlappings, and relegated the hearth in question to one of the first of them laid down in this particular series, roughly estimating the time at about seven thousand years ago.

Mr. Gilbert was followed by Mr. W. J. McGee, who described the finding of an obsidian spear-head or knife, four inches long and beautifully chipped, in Walker River Cañon, Nevada. The greatest care was taken in removing this find, and all the intelligent forethought which a trained geologist could exercise was used to mark the exact conditions of the case. Not the slightest evidence of intrusive burial or bank veneering appeared, and Mr. McGee was convinced that the weapon was deposited when the stratum containing it was laid down, the time being approximatively that of Mr. Gilbert's find.



THRESHING-SLEDGE.

Mr. John Murdoch reported at the same meeting the discovery of a pair of wooden snow-goggles, like those now used by Eskimo to protect the eyes from the glare of the sun and driving snow, in a shaft which his party dug at the depth of twenty-seven feet below the surface. Mr. Murdoch's discovery made an interesting connecting link in the interpretation of Mr. Gilbert's hearth.

Two of these finds were neolithic of the most advanced type, and located at the close of the last glacial epoch: they certainly start ten times more questions than they answer.

The national museum has lately acquired two specimens from different parts of the world, which introduce an element of confusion into archeological speculations. Both of them represent the use of stone implements of the very rudest type by peoples above savagery.

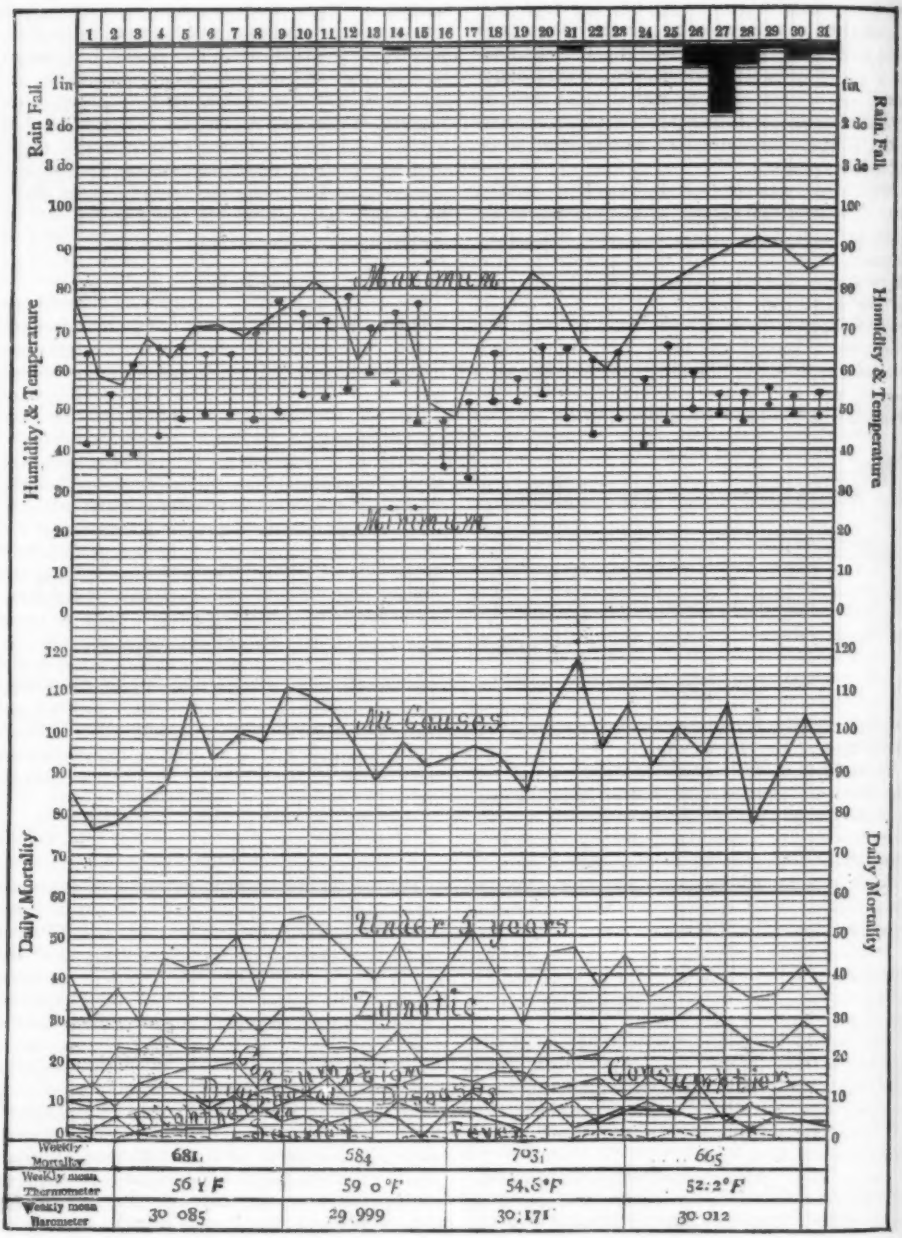
One of these specimens is a *tribulum*, or threshing-sledge, from Tunis. It is a low sledge or drag made of two planks, seventy inches long, nineteen inches wide, and ten inches thick, turned up slightly at the front, and narrowed like a square-toed shoe. Three stout battens across the upper side are securely nailed down. On the under side, just where the flat portion commences, are seventeen strips of iron, like dull knife-blades, arranged in two rows quincuncially. Along each margin of the under side are four similar dull blades. All the remainder of the bottom is occupied with sixteen rows of stone teeth, sixteen in a row, arranged quincuncially and projecting about an inch. These teeth are nothing but bits of jagged quartz, and, if picked up independently of their environment, would hardly be regarded as wrought by human hands.

The other 'paleolithic' civilized implement is a Spanish *Rallador*, or grater, from British Honduras. It consists of a plank of hard wood eighteen inches long and ten inches wide, into which have been driven nearly two thousand bits of quartz no larger than tiny arrow-heads, only they are not chipped in the least, and are less shapely.

With such material as the Gilbert hearth, the McGee spear-head, the Murdoch spectacles, the Tunis *tribulum*, and the Honduras grater accumulating around us every day, the question does not seem to be as to the antiquity of man, but whether or not archeology will help us in ascertaining his pristine condition on this continent. Dismissing the *tribulum* (the stone furniture of one of them would stock an African paleolithic cabinet), we have evidence which would satisfy some minds that at the end of the glacial epoch there lived men who built fires, chipped obsidian most beautifully, and wore snow-goggles, while in the nineteenth century A.D. men were still in the lowest story of the stone period. O. T. MASON.

THE HEALTH OF NEW YORK DURING OCTOBER.

THE health department estimates that on the 1st of October the population of the city of New York was 1,449,958. Of this number, 2,977 died during the month, which was an increase of 210 as compared with September: 1,275 of these deaths occurred among children under five years of age. There was a marked reduction of deaths from diarrhoeal diseases. The maximum mortality from this cause was in the month of July, when no less than 1,892 deaths took place; in August this was reduced to 705; in September, to 479; and in October, to 234, only about one-sixth the mortality of July. Fifty-eight more deaths are chargeable to consumption than in the preceding month, although the average for October is about that of other months of the year. But 18 persons died from scarlet-fever, — a small



Weekly Mortality	681.	584	703.	665
Weekly mean Thermometer	56 1 F	59 0 °F	54.8°F	52.2°F
Weekly mean Barometer	30 085	29 999	30.171	30.012

number, considering the size and circumstances of the great metropolis: in fact, the mortality from this cause during the entire year has been remarkably low. Diphtheria, on the other hand, has markedly increased, there being recorded 165 deaths, as against 85 for September. This is the largest number of deaths since February, with the exception of the month of May, when exactly the same number of deaths occurred as in October. A corresponding increase in this disease is noticeable in the city of Brooklyn. Diphtheria is very prevalent in other cities as well, notably in St. Louis and Chicago. The largest number of deaths in any one day in the month was 118, on the 21st. The largest daily mortality of the year was 240, on the 8th of July.

The mean temperature for October was 54.90° F., slightly below the mean for the past ten years, that being 56.33° F. At 3 P.M. on the 12th the thermometer registered the highest temperature of the month, 78° F. The mean for the past ten years in October is 79.5° F. The lowest temperature was 33° F., at 5 A.M. on the 17th, the mean for the ten years being 35.3° F. The rainfall during the month amounted to 3.07 inches, the average for the decade being 3.34 inches. Taken as a whole, October of the present year may be looked upon as an average October, differing in no important respects from the same month in other years.

CO-OPERATION IN A WESTERN CITY.

THE American economic association is to be commended for the practical and educational value of its publications. This association has an object in view, and that object is, by historical and statistical inquiries and examinations into actual conditions, to reach conclusions which will aid in solving the social and economic questions now so prominent.

Following Professor James's admirable monograph on 'The relation of the modern municipality to the gas-supply,' which attracted such wide attention, the association publishes this history of co-operation in the city of Minneapolis, throwing light upon one of the most important phases of the labor problem. Dr. Shaw has had the opportunity of observing the development of the most successful examples of co-operation which this country has yet furnished, and in a clear and pleasing style has sketched their organization, growth, and results.

The most valuable part of this monograph is that giving the history of the co-operative coopers of Minneapolis. In the introduction, reference is made to the marvellous growth of Minneapolis, now the largest wheat-receiving market and flour-milling centre in the world; the daily capacity of the mills being about thirty-five thousand barrels. To supply the demand for barrels requires about seven or eight hundred coopers, a large majority of them working in co-operative shops.

The co-operative movement in this city dates from the spring of 1868, when several journeymen coopers informally opened a co-operative shop. This experiment, owing to the want of proper organization and management, was short-lived. A like attempt in 1870 came to an end for similar reasons.

In 1870 began those experiments which have made Minneapolis the milling centre of the world, and as a consequence this city became a coopers' Mecca. From 1871 to 1874 the journeymen cooper's were able, through their union, to secure good terms from the 'bosses.' But, owing to the constantly increasing number of coopers, employment became precarious, and wages were forced down. To escape the unjust and often tyrannical treatment of the bosses, a number of the journeymen decided in 1874 to organize a co-operative company upon business-like principles.

In November, 1874, the Co-operative barrel manufacturing company was incorporated, and business was commenced with a brotherhood of sixteen men, each making an initial investment of fifteen dollars. The most important features of the company's by-laws "are those which provide that all members must be equal shareholders, and that the gains or losses of the business are to be apportioned, not *pro rata* among the members, but in proportion to the work they have done. Losses and gains of a different sort — for example, those resulting from the work of hired help, from outside ventures undertaken by the association, gains from the appreciation of real estate, or losses from fire or from non-paying creditors — are to be apportioned equally among the members. The distinction between the two kinds of profit and loss — one kind affecting the men as capitalists, and the other kind affecting them as laborers — shows keen economic insight, and has great practical value."

From its meagre beginning in 1874, this co-operative enterprise has prospered, until, in March, 1886, the president of the company estimated the cash value of its assets at $58,000, its total liabilities not exceeding $13,000. In addition to this, the entire membership of ninety are estimated as property-holders to an average amount of at least $3,000 each. A majority of the members own homes, and of this number it is interesting to

Co-operation in a western city. By ALBERT SHAW. Baltimore, *American econom. assoc.*, 1886. 8°.

note that probably two-thirds were aided by co-operative building and loan associations. Dr. Shaw attributes this remarkable success to co-operation; for, so far as he is aware, no cooper outside of the co-operative shops has similarly prospered.

The history of the other six co-operative barrel companies given in this chapter is in the main similar to that first noted.

From the experience of these companies, Dr. Shaw concludes that they are superior in stability to the non-co-operative shops; that co-operators as proprietors and capitalists have a manifest advantage in competition, for, if necessary, they can dispense with profits upon capital, and rely for support upon their wages as workingmen.

The lessons learned from the experience of these coopers can be applied in other branches of co-operation, especially where piece-work is possible, or where labor has greater relative importance than capital in production.

The account of the Co-operative agricultural colony, established near Minneapolis in April, 1886, contains many valuable suggestions; and, if this colony meets with the success indicated by present prospects, it will doubtless lead to the establishment of other co-operative colonies. A co-operative agricultural colony is apt to suggest the idea of a communistic body like the Shakers; and to correct this notion Dr. Shaw thus distinguishes them: "Communism and co-operation are antipodal in principle. Communism denies the right of private property. Co-operation proposes to enable the destitute to acquire private property. Communism usually asserts control over family relations, and it sacrifices personal liberty. Co-operation adds to the liberty of the individual because it enables him to 'pay the price of his industrial freedom;' and, as I have shown in the case of the coopers, it supplies the conditions that are most favorable to the family institution."

In giving an account of co-operative profit-sharing in the Pillsbury mills, he says, "From the employers' stand-point, I have Mr. Pillsbury's assurance that it pays." It brings about pleasant relations between employer and employee, and works to mutual advantage. The system is not, however, without its inconveniences and petty annoyances.

The Minneapolis co-operative mercantile company was established by the co-operative coopers in 1885, and its success has been very satisfactory. There is no reason why this form of co-operation which has proved so advantageous to workingmen in England should not have like results in this country.

In addition to those co-operative industries mentioned above, Minneapolis has a co-operative laundry, a co-operative painters' association, co-operative building associations, and other co-operative enterprises whose forms of organization are admirably sketched in this monograph.

Dr. Shaw attributes the fresh impulse now being manifested among workingmen to join in co-operative effort chiefly to the growth and activity of the knights of labor.

Co-operation is not prescribed as a panacea for all the present ills of labor. The author recognizes that there must be improvement along many lines, but holds that within certain limits co-operation has not only immediate applicability, but also great remedial virtue. The moral effects are reckoned its highest success. It makes men provident, temperate, and self-reliant. Co-operation is not a religion, and calls for no renunciations. It is merely a question of business advantage, and those engaged in it would not hesitate to give up the system if their condition would be bettered thereby.

This contribution to the labor literature of the day will doubtless be widely read, and lead to good results.

PARIS LETTER.

The very sad and unexpected news of Paul Bert's death reached us yesterday, exciting much surprise, as it was scarcely known that he was ill. As a politician, M. Bert was a man of passionately strong opinions; and his anti-clerical efforts, which soon became an anti-religious warfare, made him many bitter enemies. As to his work in Tonquin, it can hardly be appreciated, as it had only begun. As a scientist, M. Bert had already been virtually dead many years. He had almost entirely given up work of a physiological nature, his attention being given altogether to politics. I have had the pleasure of meeting M. Bert two or three times in his laboratory, and of listening to some of his conversations with his assistants, while he was discussing new experiments and explaining the methods that ought to be followed; and, as he spoke, new ideas appeared to be constantly coming. With a trained and intelligent corps of assistants, he would have done great work. His head was ever full of new ideas, of ingenious methods, but he required assistants to catch the ideas as they came, and to work according to his directions.

At a recent meeting of the Academy of sciences, M. Pasteur read an interesting paper on the progress of anti-hydrophobic inoculation. Up to the 31st of October, 2,490 persons had been treated at

his laboratory after having been bitten by rabid or presumably rabid animals. Of this number, 1,700 were natives of France, among whom the resulting deaths were ten, — 1 in 170. The number of cases of hydrophobia recorded in the Paris hospitals is usually ten or twelve per annum; during the year ending November, 1885, it was twenty-one. Since that date, only three cases have occurred. One was a person who had been treated by M. Pasteur, while two were persons who had not been so treated. Upon the whole, the mortality among those treated was shown to be much less than among those not treated. The most important point in M. Pasteur's paper is, that the treatment must not be the same in all cases; that where the wounds inflicted are of a serious nature, in the face especially, stronger doses are required. Such was the treatment in the case of the nineteen Russians, who, it will be remembered, were sent here from Smolensk after having been severely bitten by a rabid wolf. One died during treatment, and two others a few days afterward. Pasteur, fearing for the safety of the others, treated them anew, ending with very strong doses, which he believes is the reason for their survival. In cases where there are severe wounds of the head or face, he now proceeds as follows: on the first day he uses medulla virus 12 days old at 11 o'clock, 10 days old at 4, and 8 days old at 9; on the second day, at the same hours, he uses medulla virus of 6, 4, and 2 days respectively; on the third day, medulla virus of 1 day. The treatment on the fourth day is the same as on the first, that on the fifth the same as on the second, and the sixth as on the third; on the seventh he uses a 4-day medulla, on the eighth a 3-day, on the ninth a 2-day, and on the tenth a 1-day medulla. The process may be repeated two or three times. M. Pasteur has used this method some two months in cases such as those mentioned, with good results. Part of the paper was devoted to the effect of anti-hydrophobic treatment of dogs after inoculation, the results in dogs being exactly the same as in man, experiments having shown that prompt action and high doses are necessary, just as in the case of hydrophobia among human beings. The paper was heartily applauded by the members of the academy.

M. Loret of Lyons, in the course of his studies on ancient Egyptian funeral rites, has given some attention to the perfumes then in use; and by means of his botanical knowledge, aided by some inscriptions in ancient laboratories, he has been able to discover the ingredients composing some of them, such as 'kyphi' and 'tasi,' which were used in Greece and Rome after the conquest of Egypt. These he has reproduced from the old Egyptian formulas, 'tasi' being compounded of storax, benzoin, myrrh, and other resins, while 'kyphi' is made from roots, leaves, and seeds of different plants.

A new treatment of phthisis is proposed by Dr. Berjon of Lyons, entirely different from the bacteriological treatment recently proposed by Cantani, and unsuccessfully tried by several Italian and Spanish physicians. The new treatment is based on the fact, demonstrated by Cl. Bernard, that some gases, such as sulphuretted hydrogen, which cannot be inhaled without danger, can be introduced into the digestive tract through the rectum, passing off through the lungs without inconvenience after being absorbed by the mucous membrane of the rectum and passed through the circulatory system. Dr. Berjon uses carbonic acid mixed with sulphydric acid. Tuberculous patients have shown much improvement under this treatment, though the reason for it is not obvious, and M. Berjon does not explain why he uses the gases named rather than others. Under this new treatment, it seems that after a time the purulent discharge ceases, nocturnal sweating disappears, there is a marked increase in weight, but the bacilli are still present. Dr. Berjon's experiments are so very recent, that their results cannot yet be judged. Those who desire full information upon this subject are referred to the *Semaine médicale* of July 14 and Oct. 20, 1886. The same method has been tried in cases of asthma, and with good results. The reason for this is enigmatical, but the subject is well worth investigation.

Dr. Guilbeau, a blind professor in the Institut national for the blind, has conceived and put into execution the excellent idea of establishing a museum to contain samples or specimens of all articles specially devised for the use of the blind. He has already made quite a collection. This museum will contain much to interest not only those deprived of sight, but the general public as well, as it will present in a graphic manner a history of the efforts made to increase the comfort and the knowledge of the blind. The display of the different kinds of letters invented for reading by touch is very complete, containing all varieties introduced since Haüy's first large letters in relief and Braille's improvement, up to the latest methods.

Some time ago, M. Moissan, a young chemist, had a letter read before the Academy of sciences, announcing that he had been able to isolate from hydrofluoric acid a new substance possessing very peculiar qualities, and which he believed to be fluor. A committee was appointed, and at the meeting of the academy, on Monday last, I heard

part of M. Delray's report upon the subject. After having recalled past experiments in that direction, M. Delray stated that M. Moissan's method consisted in submitting hydrofluoric anhydric acid to the action of very strong electrical influence and intense cold (from — 23° to — 51° C.). After two or three hours of this treatment, a gas is obtained which it does not seem possible can be any thing but fluor.

The ancient Sorbonne re-opened its venerable doors some days ago; M. Lavisse, professor of modern history in the literary faculty, delivering the opening address. A new chair, that of physical geography, has been created, which will be filled by M. Vélain, a geologist.

The Musée du Louvre some time ago received several fine specimens of Persian art of very great antiquity. They consist of a series of warriors, in relief, natural size, of enamelled and colored bricks. They come from the palace of Darius, in Susa, having been brought thence by M. and Mme. Dieulafoy. These specimens of Persian art are the first that have been found, and have excited much admiration here. Unfortunately the venerable warriors are not as well suited by the climate of Paris as by that of the Susian province, the dampness of the air disagreeing with them; and, to prevent the crumbling of these remains of the great Darius's palace, they are to be submitted to a preservative process, — heating to a high temperature after having been covered with spermaceti. The operation will be an extensive one, as each brick must be treated separately.

Among the books recently published, I would call special attention to Vulpian's second volume on diseases of the spinal cord, which came from the press two days ago. In this excellent work the able physiologist makes known all that his clinical experience and physiological experiments have taught him these many years. A good book, also, is that of Alex. Peyer: 'Atlas de microscopie clinique.' It is a collection of a great number of figures relating to pathological substances and morbid products. Each plate is accompanied by a lengthy explanation. This book will prove very useful to the practitioner as well as to the student, and is gotten up in very handsome style. V.

Paris, Nov. 13.

NOTES AND NEWS.

The annual report of the surgeon-general of the navy, Francis M. Gunnell, says that 8,429 patients in the navy were treated during the year, with 52 deaths, — less than 1 to 162. He complains that the navy has not sufficient inducements in rank and pay for young physicians to become medical officers, while the army has many applicants. An appropriation is urged for a yellow-fever hospital at Widow's Island, near Portsmouth, N.H.

— Commander Schley has received the gold chronometer voted to him by the Maryland legislature as a testimonial in consideration of his bravery and efficiency in the rescue of Lieutenant Greely.

— Gas has recently been discovered at several places in Indiana in supposed paying quantities. The following places are reported to have wells which have been sunk to a successful end: Eaton and Muncie in Delaware county, and Kokomo in Howard county. Prospecting is being carried on in most of the larger towns of northern Indiana.

— Captain Anderson of the Norwegian bark Hebe reports to the U. S. hydrographic office that on Aug. 24, 1886, while in the Indian Ocean (11° 52′ south, 90° 17′ east), a tremendous sea passed the vessel, looking as if it had come from shoal water. The sea, just before and after the passage of the wave, was perfectly smooth; light breeze at the time from the south-east. No soundings were taken. The charts in this locality give no soundings, and the captain is of the opinion that the wave may have been due to an earthquake.

— The French ministers of foreign affairs and of public instruction will shortly place before the Chamber of deputies a *projet de loi* relating to literary and artistic copyright, in order to carry out the conclusions of the Berne international convention.

— The president and council of the Royal society have awarded the Copley medal to Franz Ernest Neumann of Königsberg, for his researches in theoretical optics and electro-dynamics, and the Davy medal to Jean Charles Galissard de Marignac of Geneva for his researches on atomic weights. Prof. S. P. Langley of Alleghany City was awarded the Rumford medal for his researches on the spectrum by means of the bolometer. At the same time Francis Galton, F.R.S., and Prof. Guthrie Tait were nominated for the royal medals, the former eminent for his statistical inquiries into biological phenomena, and the latter for his various mathematical and physical researches.

— In a pneumatic street-car system for which a patent has recently been granted, air is compressed at a central station, and distributed through pipes to reservoirs, situated between the tracks and below the street surface, at points on the road where supplies of compressed air for the pneumatic locomotives are needed. Tanks on the locomotive hold sufficient compressed air to propel it from

one reservoir to the next, where the supply is replenished by means of a quickly adjusted tapping-pipe which connects the reservoir with the tanks. A similar system, differing in details, was projected some years ago, but without tangible results.

— Vol. xviii. of the Tenth census of the United States ('Social statistics of cities,' part i., by G. E. Waring, jun.) treats of the principal cities of the New England states, and of New York, New Jersey, Pennsylvania, and Delaware, to the total number of 53. Part ii. will describe the principal cities of the rest of the United States. The character and scope of the work may be seen in the following list of subjects, in accordance with which each city is treated more or less fully: history; site, elevation, topography, climate, and tributary country; means of communication; streets, pavements, and public parks; sewerage, water and gas supply; police, fire, and health departments; schools, churches, and cemeteries; hospitals, penal and reform institutions; etc. At the present time, when the movement of our population toward cities is so rapid, and the problems of municipal drainage, water-supply, paving, etc., so press for a solution, the value of this compilation is apparent. The volume is freely illustrated with maps showing past as well as present conditions. The historical maps of Boston are especially worthy of notice.

— Vol. xx. of the Tenth census of the United States ('Statistics of wages, necessaries of life, trades societies, strikes and lockouts,' by J. D. Weeks), though long delayed, makes a very timely appearance, as its contents throw a flood of light upon the condition of the laboring classes, and will doubtless aid in the solution of the question, 'Do strikes pay?' It appears that during the year 1880 there occurred 762 strikes or lockouts. Of these, details were obtained regarding only 226, or less than one-third. As a consequence of these 226 strikes and lockouts, there was a loss in wages of $3,711,097. If the same proportion carries through the others, there was a direct loss to the laborer of nearly $12,000,000, or fully one per cent of the total wages paid. This takes no account of industries which were broken up or driven away in consequence of such strikes. An examination of the comparative tables of wages does not indicate that the results in raising wages have been commensurate with this loss.

— According to the vital statistics of Germany for 1885, 4,091 males and 1,209 females committed suicide. The methods of self-destruction were as follows: hanging, 3,567; drowning, 1,177; shooting, 611; poison, 232; cutting their throats, 113; throwing themselves under railroad trains, 77; throwing themselves from heights, 49.

— Captain Gager of the steamship Louisiana reports to the U.S. hydrographic office at New Orleans, that, on his last trip from New York to that port, he found an almost entire absence of current in the Gulf Stream. Captain Gager states that this has generally been his experience when the water in the Mississippi was unusually low, and connects the absence of Gulf Stream current with this fact. This is not unusual after a strong northerly wind.

— The *Boston medical and surgical journal* says, that, in estimating human character, the ear affords a better criterion than any of the other features. An ear which presents no well-defined elevations and depressions indicates selfishness and want of delicacy of perception. The possessor of a thick, well-shaped, highly tinted appendage, set well forward, is usually ungrateful, grasping, and lacking in depth of feelings. A thin ear indicates keen susceptibility; and an ear that projects from the head, alertness. A broad ear is more coarsely practical. The perfect ear is one which lies close to the head, and is gracefully rounded with pretty curves, strong lines, and firm, delicately tinted cartilage.

— Numerous instances have been recorded of late in the medical journals, of the complete reunion of portions of fingers which had been cut off from the hand, in some cases by the knife, and in others by the axe. In one case a man, in cutting kindlings for the morning fire, accidentally cut off the end of his thumb. He had gone from the place some twenty feet, when he returned, picked up the end, wiped it and replaced it, binding it in its original place as nearly as possible. The wound united; and the finger is now as good as ever, save that its sensibility is somewhat diminished. In another case a boy chopped off the ends of three fingers. He was seen by a physician three or four hours after the accident. The ends of the fingers had been found in the snow, and were brought to him. He attached them, and two of the three united.

— A physician, in a letter to the *Medical record*, narrates a case in which one of his patients, who is suffering from dyspepsia accompanied by the eructation of gas, burned his hair, eyebrows, and mustache by the ignition of some of the gas as it came from his mouth, while at the time he held a lighted match in his hand.

— At a recent meeting of the New York pathological society a case was reported in which a negro child, which died at the age of two months,

had but one lung, the left. The right was rudimentary, and had never been inflated. The heart was also malformed, having but one auricle and one ventricle, both being the left.

— The *New York medical record* has the following, not very flattering account of the family of the great Caesar: "In the Claudian-Julian family, beginning with Julius Caesar himself, and ending with Nero, we have an almost unbroken line of neuroses. Caesar himself was epileptic; but probably the disease developed late in life, from exposure and excesses, and did not much affect his health. Augustus, his grand-nephew, had, it is believed, writer's cramp. Julia, his daughter, seems to have been little more than a nymphomaniac; she had an imbecile son. Tiberius was a man naturally heartless, cruel, and licentious; in his later years he seems to have lost all moral sense, and illustrated the most shameless sensibility and cruelty. Caligula, reputed great-grandson of Augustus, was epileptic as a boy, badly formed and weak-minded as a man. He stuttered, was insomnious, and apparently had hallucinations. Claudius was also weak-minded, timid, and credulous, with unsteady gait, weak knees, shaking head, and dribbling lips."

— In speaking of the preservation of dead bodies, *Gaillard's medical monthly* says that Edward I., who died in 1307, was found not decayed four hundred and sixty-three years subsequently. The flesh on the face was a little wasted, but not putrid. The body of Canute, who died in 1017, was found fresh in 1766. Those of William the Conqueror and his wife were perfect in 1522. In 1569 three Roman soldiers, in the dress of their country, fully equipped with arms, were dug out of a peat-mass near Aberdeen. They were quite fresh and plump after a lapse of about fifteen hundred years. In 1717 the bodies of Lady Kilsyth and her infant were embalmed. In 1796 they were found as perfect as in the hour they were embalmed. Every feature and limb was full. The infant's features were as composed as if he had only been asleep for eighty years. His color was as fresh and his flesh as plump and full as in the perfect glow of health. The smile of infancy and innocency was on his lips. At a little distance it was difficult to distinguish whether Lady Kilsyth was alive or dead.

— The British schooner Souvenir (Captain Fraser) reports to the U. S. hydrographic office that they encountered a very severe electric storm on the 24th of November, off Block Island. A heavy gale was blowing from south-west to west. There was terrific squalls with remarkably brilliant lightning and tremendous thunder, and torrents of rain. The vessel was completely covered with St. Elmo's fire, and the sea was full of phosphorescence. The compasses and barometer were very greatly affected, the former varying from one to three points either way, and the mercury in the latter trembling and 'pumping' violently.

— During the annual meeting of the American society of microscopists at Chautauqua, N.Y., last August, some of the members under charge of the 'working session committee,' collected, by means of a surface-net, quite a number of fresh-water forms from the lake. The Crustacea found included, of the Copepoda, two species of Diaptomus, two of Cyclops, and one each of Epischura and Ergasilus; of the Cladocera, there were found Daphnella brachyura (Lievin), Daphnia cederstromii (Schoedler), Chydorus sphaericus (O. Fr. Muller), Leptodora hyalina (Lilljeborg); also Ceriodaphnia and Bosmina. The Crustacea were put in the hands of Mr. C. S. Fellows for identification, who will report at the next meeting of the association.

— The Brazilian government has appropriated ten thousand dollars for an agricultural experiment-station, and inquiries are being made abroad for a competent specialist to take charge of it. There is an agricultural school near Bahia, in charge of Dr. F. M. Draenert, a German, but thus far there are no experiment-stations in the empire.

— Despatches from Buenos Ayres state that cholera is on the increase there. Seventeen new cases and nine deaths were reported in the city in one day. In Rosario thirty-four new cases and twenty-five deaths occurred, and at Cordova twelve cases and five deaths.

— A case of actinomycosis is said to exist in Springfield, Ill., in the person of a young lady employed in a manufacturing establishment in that place. Its common name is 'lump-jaw,' and appears as a tumor of the jaw. Although affecting cattle and swine, it very rarely attacks human beings. This is certainly true for this country, although thirty cases are said to have occurred in Germany in four years. It is a disease caused by a vegetable parasite, the actinomycis or ray-fungus. Some place this parasite among the Schizomycetes, others among the fungi. The disease may also appear in the lungs and in the intestines. The germs are supposed to enter the jaw through decayed teeth or the tonsils, and the resulting tumor shows itself at the angle of the jaw.

— The nineteenth annual meeting of the Kansas academy of science was held at Emporia, Kan., Nov. 17, 18, and 19. The welcoming address was given by Pres. A. R. Taylor of the State normal

school, and evening lectures by the president of the academy, Prof. E. L. Nichols, of the University of Kansas, on 'The sky,' and by Prof. John C. Branner, of the University of Indiana, on 'Geologists, professional and unprofessional.' The following papers were read: F. H. Snow, Rain cycles in Kansas; E. B. Cowgill, Meteors of the Biela train; T. H. Dinsmore, jun., The meteors of 1883 and 1886; T. H. Dinsmore, jun., and A. D. Crooks, Color-blindness in the State normal school: E. L. Nichols, On black and white; W. S. Franklin, On some curves allied to Lissajou's figures: E. L. Nichols and W. S. Franklin, A preliminary note on the electro-motive force due to magnetism; E. B. Cowgill, On the magnetization of a ring; T. H. Dinsmore, jun., A new illustration of the arc light; D. S. Kelly, The coal-measures of Lyon county; Robert Hay, Historical sketch of geological work in Kansas; A. H. Thompson, Additional notes on history of geological work in Kansas: F. H. Snow, On the species of Dakota leaves in the museum of the University of Kansas; Joseph Savage, Pink and white terraces of New Zealand; Concretionary forms; Robert Hay, Natural gas in eastern Kansas; G. H. Failyer and J. T. Willard, Preliminary report on the chemistry of the natural gases of Kansas; E. H. S. Bailey, Miscellaneous chemical notes; G. H. Failyer and J. T. Willard, Some notes on the determination of lithium, and on its occurrence in a mineral spring in Jewell county, Kan.; On some mineral waters of Kansas; E. H. S. Bailey, On the composition of the lime solution in which straw is digested in the straw-paper manufacture; E. C. Franklin, Proximate analysis of Artemisia annua; L. E. Sayre, A preliminary analysis of Astragalus mollisimus (loco weed); J. T. Willard, On variations in the sugar-content of Sorghum vulgare, with an account of some efforts to improve the species; T. H. Dinsmore, jun., New distillation apparatus; T. H. Dinsmore, jun., and W. S. Picken, Notes on the effects of oxygen on animal life; M. A. Bailey, The minus sign; B. B. Smyth, Figurate series; A. H. Thompson, Ethics among animals; J. A. Udden, Some mounds on Paint Creek, McPherson county; John D. Parker, On mounds in Davis county; J. R. Mead, Explorations among the Pueblo ruins of New Mexico; L. L. Dyche, Notes on the humming-birds; N. S. Goss, Additions to the catalogue of the birds of Kansas; L. L. Dyche, List of birds observed near Hermit's Peak, Las Vegas, N. Mex., with notes; F. H. Snow, Note of the occurrence in Kansas of the Mississippi shapper, or alligator turtle; F. W. Cragin, On a new variety of a rare Sonoran reptile from Kansas; J. R. Mead, List of the fresh-water Mollusca of Sedgwick county; E. A. Popenoe, A list of Kansas Hymenoptera in the museum of the state agricultural college; C. L. Marlatt, On the cedar saw-fly; W. Knaus, On the distribution of species of Kansas Coleoptera; E. A. Popenoe, A revised list of the Coleoptera of Kansas; C. L. Marlatt, Notes on the oviposition of the Buffalo tree-hopper; F. H. Snow, A preliminary list of Kansas desmids; W. A. Kellerman and M. A. Carleton, Second list of Kansas parasitic fungi; W. A. and Mrs. Kellerman, Kansas forest-trees identified by leaves and fruit; J. H. Carruth, Scraps of botanical history; F. H. Snow, A list of plants collected in New Mexico by the scientific expeditions of the University of Kansas.

— Messrs. Ticknor & Company, Boston, announce the publication of Goethe's 'Faust, a commentary,' by Denton J. Snider (2 vols., 12°, $3.50). This is a treatise on the greatest of German poems, giving its history, critical standards, and outline, and analyses and explanations of all the scenes and situations, as seen from a philosophical point of view.

— The seventh annual meeting of the American society of mechanical engineers was held in this city from Nov. 29 to Dec. 3, Vice-President Towne presiding in the absence of President Sellers. The opening address was a review of the early history of steam-engines in this country, by Horatio Allen. The following papers were read: Prof. F. Reuleux, Friction in toothed gearing; Prof. R. H. Thurston, Friction of non-condensing engines; A. Wells Robinson, Dredging machinery; Benjamin Baker, The working-stress of iron and steel; Andrew C. Campbell, A new conicograph; Prof. G. Lanza, Strength of shafting; William Kent, Heating capacity of water-gas: Professor Alden, Formulae and tables for calculating the effect of reciprocating parts of high-speed engines; William Cowles, Fire-boats; George H. Barrus, The new calorimeter; Oberlin Smith, Intrinsic value of special tools; W. E. Partridge, Capital's need of high-priced labor. Among the topics discussed were the following: Transmission of power by flying rope; Practical value of the sand-blast for sharpening files; Feed-pumps and injectors; Effects of exposure upon aluminium bronze; Annealing-furnaces for small gray-iron castings; Grit in grinding-rooms, yards, and shops; Expansion and contraction of drawing-paper; Cutting of intricate templets from very thin metal; Equipment of mechanical engineering laboratory; Problems for students of mechanical engineering in the last year of their regular course; Power required to drive modern American machine-tools. The officers elected for the ensuing year are, president,

George H. Babcock; vice-presidents, Joseph Morgan, jun., Charles T. Porter, Horace S. Smith; managers, Frederick G. Coggin, John T. Hawkins, Thomas R. Morgan, sen.; treasurer, William H. Wiley.

— It is announced that the British government has taken possession of the island of Socotra, in the Indian Ocean, heretofore belonging to the imamat of Muscat. For many years the British government had subsidized the governor of the island, but had had no direct control over it. Socotra lies about 120 miles east of Cape Guardafui, near the entrance to the Gulf of Aden, and in the direct route of vessels passing between Suez and India. The island is 70 miles long by 20 miles broad, with an area of about 1,000 square miles, and a population of nearly 5,000, mostly Arabs, negroes, and Portuguese. A range of granite and limestone mountains extends through the middle of the island, rising in places to a height of 5,000 feet. The low coast-lands are fertile, producing aloes, dragon's-blood and other gums, tamarinds, dates, and tobacco.

— Snow hall, for the uses of the natural history department of the University of Kansas, at Lawrence, was formally dedicated on Nov. 17.

— The government of Queensland is taking vigorous measures to guard that colony against the rabbit-plague mentioned in *Science* of Nov. 12. A rabbit-proof fence of wire netting will be erected along the boundary-line between Queensland and New South Wales, with an extension of a hundred miles northward along the boundary of South Australia. For this purpose, 2,550 miles of fencing wire and 450 miles of wire netting have already been purchased in England.

— While the question of the advisability of women studying medicine is being discussed, the women are settling it for themselves by entering the medical schools in no inconsiderable number. At Zurich twenty-nine are now pursuing that study; in London, forty-eight; and at Paris, one hundred and three. At the latter eighteen have obtained their diplomas of doctor during the past seven years.

— An unsinkable lifeboat recently patented by a gentleman in Buffalo, N.Y., possesses some novel features. The entire lower part of the boat is filled with sheets or slabs of cork, set up edgewise and fastened together. Above this is a filling of rushes, set up vertically and having their ends rendered water-proof. Above the cork and rushes is a water-tight deck, which separates the lower half of the boat from the upper half, where seats are provided for crew and passengers.

LETTERS TO THE EDITOR.

Fort Ancient, Warren county, Ohio.

Having recently, in company with Messrs. W. H. Holmes and Charles M. Smith, visited some of the more noted ancient works of Ohio, among them the one mentioned above, I have concluded that a few words in regard to its present condition might be of interest to general readers as well as to archeologists.

This work has been so often described, that most readers interested in our antiquities are familiar with it. The first notice and plan were given in the 'Portfolio' (1809). Both plan and description were copied by Caleb Atwater in his memoir in the first volume of the Transactions of the American antiquarian society (1820). About twenty years later it was carefully surveyed by Prof. John Locke, his description and plat being published in the Transactions of the Association of American geologists and naturalists (1843). This plat was copied by Squier and Davis in 'Ancient monuments,' and is the one from which all subsequent figures have been taken. It is quite accurate in the main; so nearly so, in fact, that another complete survey may be deemed unnecessary. Some slight corrections might be made; but these, with two exceptions, which will be named, are of minor importance.

As remarked by Squier and Davis, this is "one of the most extensive, if not the most extensive, work of this class in the entire west." It is also one of the best preserved, the main portion having suffered but little from the plough; the surrounding wall being uninjured save at the points where the turnpike cuts through it, and at a few places where ravines have been recently formed. As earthen walls change but little so long as they are covered with vegetation, it is more than probable that we see this great structure (with the exceptions hereafter noted) as it was when abandoned by those last occupying and using it. For example: the wall at *d* (Squier and Davis's figure), in the north-eastern corner, although in an open field, shows no signs of material wearing; the height being now a little over nineteen feet, and width at base sixty-seven feet, — almost exactly the measurements given by Atwater. Growing on the top are some large trees whose roots are not at all exposed. With the exception of a short stretch at the point mentioned, the wall throughout is still in the unbroken forest.

Evidences of wearing are observable at some of the ravines it crosses, and a few of the smaller gullies appear to have been worn since the wall was built (a fact also mentioned by Atwater), though in most cases the adaptation of the wall to the slopes shows that these existed when it was thrown up. Professor Locke states that the "embankment is in several places carried down into ravines from fifty to one hundred feet deep, and at an angle of thirty degrees, *crossing a streamlet at the bottom*, which, by showers, must often swell to a powerful torrent. But in all instances the embankment may be traced to within three to eight feet of the stream." Although our visit was during an unusually dry season, when the ravines contained no water, the indications observed did not bear out what seems to be implied by Professor Locke's language, — that the wall originally crossed the ravines: on the contrary, they appear to show that the wall stopped on the sides at the points reached by the streamlets in time of highest water. It is true that at some points it has been

broken through by the pressure of water accumulated behind it, but in all these cases it is apparent that the ravines have been formed since the wall was built. At only one point did we observe a break made since Professor Locke's survey. This is through the long, curved stretch directly east from where the so-called 'two large mounds' are represented on the plat.

If these ravines were defended, as is quite probable, it must have been by some other means than a wall of earth, which could not have withstood the pressure through a single rainy season.

Although the wall is built chiefly of earth (composed largely in most places of clay) gathered from the adjacent surface, and from the interior ditch where it exists, it is partially underlaid at numerous points with stones, which in some cases were laid up loosely. This was noticed at the north-western corner, where the wall has been cut through to make way for the turnpike, and also at the extreme south-eastern corner. At almost every point where a slight cut has been made for a farm-road or other purpose, stones were observed.

generally crossed at the upper terminus by a wall of the ordinary height, the ridge immediately outside being cut down several feet so as to present a steep slope corresponding with the outside of the wall. This gives the appearance of a terrace on the hillside a few feet below the wall. On the other hand, where similar ridges form approaches to the south portion, and also, at some places, to the north portion, the defences are formed by raising the wall considerably above the ordinary height.

The isthmus, or point where the opposite walls approach nearest to each other, just north of the so-called 'two large mounds,' is undefended, though on the right or east side the ascent is by no means difficult: the declivity on the west forms a sufficient defence without a wall. The plat at this point is slightly erroneous, as the wall on the west side does not extend quite so far north as represented. It is possible that this extension was made theoretically, on the supposition that the wash which is apparent here (shown in Atwater's figure) had carried away the wall. That a small portion of the extreme end was carried down, is true, but the ridge on which it

WALL OF FORT ANCIENT.

Mr. George Ridge, who lives near the two mounds at the north-eastern corner, and who has for years studied the fort, insists that the wall is to a considerable extent underlaid with stone. This fact is also mentioned by Squier and Davis, who state that "they are *water-worn*, and seem for the most part to have been taken from the river." This is certainly an error, as they are almost entirely of flat pieces of limestone, showing no indications of having been water-worn, such as could be obtained on the surface or immediately below the brow of the hill.

The two points at the isthmus, or neck, marked on the plat '*two large mounds*,' are not 'mounds' properly so called, but the elevated terminations of the walls on the sides, the opening here being an important gateway. The point at the extreme south-eastern corner, marked on the plat '*mound*,' is only an elevated portion of the wall thrown up to defend an easy approach at this point.

One of the most interesting facts observed, of which mention has not heretofore been made, is the different methods adopted of defending the more easy approaches. On the north, these approaches, which are usually narrow, ascending ridges, are

runs never crossed the gap. Besides, in the original plat, as given in the 'Portfolio,' the wall is represented as extending *up to* the so-called 'wash' (which is not a 'wash,' but a small land-slide), and stopping there. The wall never existed along the top at this point.

The parallel walls starting out from the two mounds near the north-eastern corner, represented in 'Supplementary plan A,' Squier and Davis's figure, are entirely obliterated except at the fence crossings, where slight traces of them are visible. The included mound at the east end is yet distinctly visible. Mr. Ridge informed us that he has discovered, at a depth of about eighteen inches, a pavement of stone reaching from wall to wall, and from the mounds eastward over a hundred yards. We had an opportunity of inspecting this at only one point, and know nothing further in regard to it than his statement, which I believe to be trustworthy.

Some of the problems presented by this work are very difficult to solve, though others can be, in a measure at least, satisfactorily determined without resort to mere speculation.

That it was built and intended as a work of defence is so apparent, that it is scarcely possible there

should be conflicting opinions on this point. The situation chosen, and the character of the work, seem sufficient to place this conclusion beyond doubt. Yet there are few, if any, satisfactory indications, aside from the character and extent of the work, that any portion of the enclosed area was occupied for any considerable length of time as a village site. That a work of such magnitude and extent could have been hastily cast up for temporary protection by a savage, or even by a semi-civilized people, is incredible. Moreover, there are reasons for believing that the whole fort was not built at one period of time, but was progressive. The southern part was apparently built first, the northern section being a subsequent addition, made possibly because of increase in the population, most likely by the incoming of parties or clans seeking protection.

On the other hand, the evidences of long-continued occupation, such as are seen in and about other works, — as, for example, the Etowah and Messier groups in Georgia, the Cahokia group in Illinois, and several of the works in south-eastern Missouri, — are wanting. This is also singularly true of several other noted works of Ohio. The refuse and *débris* of a populous village, occupying for a long time a comparatively limited area, could not, as is proven by the instances referred to, be entirely dissipated by sixty years of cultivation, even though carried on continuously. The areas forming the sites of some of the mound-builders' villages of south-eastern Missouri, are yet, after half a century of constant cultivation, a foot or more above the surrounding level.

What is the explanation of this singular fact? I can think of but one which seems at all satisfactory, and that is, that these works were built by a populous tribe, which was being pressed step by step before a victorious foe.

The defensive works of Ohio present to me no evidences of great antiquity: indeed, the indications are in the opposite direction; and, in my opinion, we are not warranted in assigning to them an age antedating the latest possible period which we are justified in fixing upon as that at which the Indians first entered this territory.

I give herewith a figure, from a sketch by Mr. Holmes, showing that part of the wall which crosses the field near the two mounds at the north-eastern corner, including the part where the turnpike cuts through, marked *d* by Squier and Davis.

There is evidently a very great mistake in Dr. Locke's estimate as to the amount of earth in the embankment. If we take the length of the wall at four and one-half miles, the average height at ten feet, and the average base at thirty-five feet, the volume is about 154,000 cubic yards, or less than one-fourth the amount given by Dr. Locke, his estimate being 628,800 cubic yards. If there is any error in my figures, it is such as will overrun the true amount, rather than fall below it. CYRUS THOMAS.

Milk-sickness.

In the milk-sickness district, referred to in my letter in *Science* of Nov. 26, the belief prevails, and assertions are made, that the disease disappears so soon as the land is cleared and cultivated, and some cite instances where denuding the land of its forest-growth has caused the disease to cease: so it may be set down as a fact, with considerable credibility, that, as a general rule, clearing and cultivating the land removes the cause of the disease, and any thing to the contrary will be an exception to the rule. I can refer definitely to only one of these exceptions, yet I have heard of a few others. Dr. W. S. Sims of this place tells of a farmer in Hamburg township, Jackson county, N.C., who has a half-acre lot enclosed with his dwelling. In this enclosure are fruit-trees and some of the native grasses, and the place has been under cultivation for twenty years or more, and yet whenever cattle are turned upon that lot during grazing season they are sure to die with the disease in a few days. From what I learned in Macon county, N.C., if they were not practising on my credulity, I am satisfied that that section will afford isolated exceptions to the general rule. In the lot above referred to, there is no water obtainable except from a large creek of swift-running water, that bounds one side of the lot. In that immediate vicinity there is no milk-sickness outside the enclosed half-acre. J. W. WALKER.

Pine Mountain, Ga., Dec. 2.

A new mammal from the American triassic.

In 1857, Professor Emmons (American geology, part vi. p. 93) described the left lower jaw of a small mammal from the Chatham coal-field in North Carolina, naming it Dromatherium sylvestre. His description was based upon one nearly perfect jaw and two fractured specimens. The first, or type specimen, is now in the geological museum of Williams college, and one of the others is in the collection of the Philadelphia academy. Through the kindness of Prof. Samuel F. Clarke, I have recently had an opportunity of comparing these rare specimens, and find that the Philadelphia fossil belongs to a genus quite distinct from Dromatherium, and unlike any thing hitherto described by Professors Owen or Marsh. The jaw is two thirds as long as that of Dromatherium, and much more slender. The symphysial and angular portions are broken away. A faint impression upon the matrix seems to indicate that

the coronoid process was low. The lower border has a downward process like that in Peramus. It is uncertain whether the inner or outer aspect is uppermost. The teeth are represented by two molars, probably the second and fourth, and two so-called premolars. The series as a whole occupy a greater linear space than those of Dromatherium. The premolars are simple, erect cusps, with a posterior basal cusp. The molars give the principal character to the jaw. Each has a central cone supporting two smaller cones on its anterior and posterior slopes. Hence, together with the slender character of the jaw, the fossil may be called Microconodon tenuirostris. In the drawing the dotted lines indicate the probable shape and position of the four missing molars. HENRY F. OSBORN.

Princeton, N.J., Dec. 1.

SCIENCE.—SUPPLEMENT.

FRIDAY, DECEMBER 10, 1886.

SCIENTIFIC MEN AND THEIR DUTIES.

THE honor of the presidency of such a society as this — carrying with it, as it does, the duty of giving at the close of the term of office an address on some subject of general interest — has been aptly compared to the little book mentioned in the Revelations of St. John, — the little book which was 'sweet in the mouth but bitter in the belly.' I can only thank you for the honor, and ask your indulgence as to the somewhat discursive remarks which I am about to inflict upon you.

There is a Spanish proverb to the effect that no man can at the same time ring the bell and walk in the procession. For a few moments to-night I am to ring the bell, and being thus out of the procession I can glance for a moment at that part of it which is nearest. At first sight it does not appear to be a very homogeneous or well-ordered parade, for the individual members seem to be scattering in every direction, and even sometimes to be pulling in opposite ways; yet there is, after all, a definite movement of the whole mass in the direction of what we call progress. It is not this general movement that I shall speak of, but rather of the tendencies of individuals or of certain classes; some of the molecular movements, so to speak, which are not only curious and interesting of themselves, but which have an important bearing upon the mass, and some comprehension of which is necessary to a right understanding of the present condition and future prospects of science in this country.

The part of the procession of which I speak is made up of that body or class of men who are known to the public generally as 'scientists,' 'scientific men,' or 'men of science.' As commonly used, all these terms have much the same significance; but there are, nevertheless, shades of distinction between them, and in fact we need several other terms for purposes of classification of the rather heterogeneous mass to which they are applied. The word 'scientist' is a coinage of the newspaper reporter, and, as ordinarily used, is very comprehensive. Webster defines a scientist as being 'one learned in science, a savant,' — that is, a wise man, — and the word is often used in this sense. But the suggestion which the word conveys to my mind is rather that of one whom the public suppose to be a wise man, whether he is so or not, of one who claims to be scientific. I shall therefore use the term 'scientist' in the broadest sense, as including scientific men, whether they claim to be such or not, and those who claim to be scientific men whether they are so or not.

By a scientific man I mean a man who uses scientific method in the work to which he specially devotes himself; who possesses scientific knowledge, not in all departments, but in certain special fields. By scientific knowledge we mean knowledge which is definite and which can be accurately expressed. It is true that this can rarely be done completely, so that each proposition shall precisely indicate its own conditions, but this is the ideal at which we aim. There is no man now living who can properly be termed a complete savant, or scientist, in Webster's sense of the word. There are a few men who are not only thoroughly scientific in their own special departments, but are also men possessed of much knowledge upon other subjects, and who habitually think scientifically upon most matters to which they give consideration; but these men are the first to admit the incompleteness and superficiality of the knowledge of many subjects which they possess, and to embrace the opportunity which such a society as this affords of meeting with students of other branches and of making that specially advantageous exchange in which each gives and receives, yet retains all that he had at first.

Almost all men suppose that they think scientifically upon all subjects; but, as a matter of fact, the number of persons who are so free from personal equation due to heredity, to early associations, to emotions of various kinds, or to temporary disorder of the digestive or nervous machinery, that their mental vision is at all times achromatic and not astigmatic, is very small indeed.

Every educated, healthy man possesses some scientific knowledge, and it is not possible to fix any single test or characteristic which will distinguish the scientific from the unscientific man. There are scientific tailors, bankers, and politicians, as well as physicists, chemists, and biologists. Kant's rule, that in each special branch of knowledge the amount of science, properly so called, is equal to the amount of mathematics it contains, corresponds to the definition of pure science as including mathematics and logic, and nothing

President's address before the Philosophical society of Washington, D.C., Dec. 4, 1886, by John S. Billings.

else. It also corresponds to the distinction which most persons, consciously or unconsciously, make between the so-called physical, and the natural or biological sciences. Most of us, I presume, have for the higher mathematics, and for the astronomers and physicists who use them, that profound respect which pertains to comparative ignorance, and to a belief that capacity for the higher branches of abstract analysis is a much rarer mental quality than are those required for the average work of the naturalist. I do not, however, propose to discuss the hierarchy of the sciences; and the term 'science' is now so generally used in the sense of knowledge, more or less accurate, of any subject, more especially in the relations of causes and effects, that we must use the word in this sense, and leave to the future the task of devising terms which will distinguish the sciences, properly so called, from those branches of study and occupation of which the most that can be said is that they have a scientific side. It is a sad thing that words should thus become polarized and spoiled, but there seems to be no way of preventing it.

In a general way we may say that a scientific man exercises the intellectual more than the emotional faculties, and is governed by his reason rather than by his feelings. He should be a man of both general and special culture, who has a little accurate information on many subjects and much accurate information on some one or two subjects, and who, moreover, is aware of his own ignorance and is not ashamed to confess it.

We must admit that many persons who are known as scientists do not correspond to this definition. Have you never heard, and perhaps assented to, some such statements as these: "Smith is a scientist, but he doesn't seem to have good common sense," or "he is a scientific crank"?

The unscientific mind has been defined as one which "is willing to accept and make statements of which it has no clear conceptions to begin with, and of whose truth it is not assured. It is the state of mind where opinions are given and accepted without ever being subjected to rigid tests." Accepting this definition, and also the implied definition of a scientific mind as being the reverse of this, let us for a moment depart from the beaten track which presidential addresses usually follow, and, instead of proceeding at once to eulogize the scientific mind and to recapitulate the wonderful results it has produced, let us consider the unscientific mind a little, not in a spirit of lofty condescension and ill-disguised contempt, but sympathetically, and from the best side that we can find. As this is the kind of mind which most of us share with our neighbors, to a greater or less degree, it may be as well not to take too gloomy a view of it. In the first place, the men with unscientific minds form the immense majority of the human race.

Our associations, habits, customs, laws, occupations, and pleasures are, in the main, suited to these unscientific minds, whose enjoyment of social intercourse, of the every-day occurrences of life, of fiction, of art, poetry, and the drama, is perhaps none the less because they give and accept opinions without subjecting them to rigid tests. It is because there are a goodly number of men who do this that the sermons of clergymen, the advice of lawyers, and the prescriptions of physicians have a market value. This unscientific public has its uses. We can at least claim that we furnish the materials for the truly scientific mind to work with and upon; it is out of this undifferentiated mass that the scientific mind supposes itself to be developed by specialization, and from it that it obtains the means of its own existence. The man with the unscientific mind, who amuses himself with business enterprises, and who does not care in the least about ohms or pangenesis, may, nevertheless, be a man who does as much good in the world, is as valuable a citizen, and as pleasant a companion, as some of the men of scientific minds with whom we are acquainted.

And in this connection I venture to express my sympathy for two classes of men who have in all ages been generally condemned and scorned by others, namely, rich men and those who want to be rich.

I do not know that they need the sympathy, for our wealthy citizens appear to support with much equanimity the disapprobation with which they are visited by lecturers and writers, — a condemnation which seems in all ages to have been bestowed on those who have by those who have not.

So far as those who actually are rich are concerned, we may, I suppose, admit that a few of them — those who furnish the money to endow universities and professorships, to build laboratories, or to furnish in other ways the means of support to scientific men — are not wholly bad. Then, also, it is not always a man's own fault that he is rich; even a scientist may accidentally and against his will become rich.

As to those who are not rich, but who wish to be rich, whose chief desire and object is to make money, either to avoid the necessity for further labor, or to secure their wives and children from want, or for the sake of power and desire to rule, I presume it is unsafe to try to offer any apologies for their existence. But when it is claimed for

any class of men, scientists or others, that they do not want these things, it is well to remember the remarks made by old Sandy Mackay after he had heard a sermon on universal brotherhood: "And so the deevil's dead. Puir auld Nickie; and him so little appreciated, too. Every gowk laying his sins on auld Nick's back. But I'd no bury him until he began to smell a wee strong like. It's a grewsome thing is premature interment."

I have tried to indicate briefly the sense in which the terms 'scientist' and 'scientific man' are to be used and understood, and you see it is not an easy matter. The difficulty is less as regards the term 'man of science.' By this expression we mean a man who belongs to science peculiarly and especially, whose chief object in life is scientific investigation, whose thoughts and hopes and desires are mainly concentrated upon his search for new knowledge, whose thirst for fresh and accurate information is constant and insatiable. These are the men who have most advanced science, and whom we delight to honor, more especially in these later days, by glowing eulogiums of their zeal, energy, and disinterestedness.

The man of science, as defined by his eulogists, is the *beau idéal* of a philosopher, a man whose life is dedicated to the advancement of knowledge for its own sake, and not for the sake of money or fame, or of professional position or advancement. He undertakes scientific investigations exclusively or mainly because he loves the work itself, and not with any reference to the probable utility of the results. Such men delight in mental effort, or in the observation of natural phenomena, or in experimental work, or in historical research, in giving play to their imagination, in framing hypotheses and then in endeavoring to verify or disprove them, but always the main incentive is their own personal satisfaction (with which may be mingled some desire for personal fame), and not the pleasure or the good of others. Carried to an extreme, the eulogy of such men and their work is expressed in the toast of the Mathematical society of England: "Pure mathematics; may it never be of use to any man!" Now, it is one thing to seek one's own pleasure, and quite another thing to pride one's self upon doing so. The men who do their scientific work for the love of it do some of the best work, and, as a rule, do not pride themselves on it, or feel or express contempt for those who seek their pleasure and amusement in other directions. It is only from a certain class of eulogists of pure science, so called, that we get such specimens of scientific 'dudeism' as the toast just quoted, opposed to which may be cited the Arab saying that "a wise man without works is like a cloud without water."

There are other men who devote themselves to scientific work, but who prefer to seek information that may be useful; who try to advance our knowledge of nature's laws in order that man may know how to adapt himself and his surroundings to those laws, and thus be healthier and happier. They make investigations, like the men of pure science, — investigations in which they may or may not take pleasure, but which they make, even if tedious and disagreeable, for the sake of solving some problem of practical importance. These are the men who receive from the public the most honor, for it is seen that their work benefits others. After all, this is not peculiar to the votaries of science. In all countries and all times, and among all sorts and conditions of men, it has always been agreed that the best life, that which most deserves praise, is that which is devoted to the helping of others, which is unselfish, not stained by envy or jealousy, and which has as its main pleasure and spring of action the desire of making other lives more pleasant, of bringing light into the dark places, of helping humanity.

But, on the other hand, the man who makes a profession of doing this, and who makes a living by so doing, the professional philanthropist, whether he be scientist or emotionalist, is by no means to be judged by his own assertions. Some wise German long ago remarked that '*esel singen schlecht, weil sie zu hoch anstimmen*,' — that is, 'asses sing badly because they pitch their voices too high,' — and it is a criticism which it is well to bear in mind.

In one of the sermons of Kin O[1] the preacher tells the story of a powerful clam who laughed at the fears of other fish, saying that when he shut himself up he felt no anxiety; but on trying this method on one occasion when he again opened his shell he found himself in a fishmonger's shop. And to rely on one's own talents, on the services one may have rendered, on cleverness, judgment, strength, or official position, and to feel secure in these, is to court the fate of the clam.

There are not very many men of science, and there are no satisfactory means of increasing the number; it is just as useless to exhort men to love science, or to sneer at them because they do not, as it is to advise them to be six feet three inches high, or to condemn a man because his hair is not red.

While the ideal man of science must have a "clear, cold, keen intellect, as inevitable and as merciless in its conclusions as a logic engine," it would seem that, in the opinion of some, his greatness and superiority consist not so much in

[1] *Cornhill magazine*, August, 1869, p. 196.

the amount of knowledge he possesses, or in what he does with it, as in the intensity and purity of his desire for knowledge.

This so-called thirst for knowledge must be closely analogous to an instinctive desire for exercise of an organ or faculty, such as that which leads a rat to gnaw or a man of fine physique to delight in exercise. Such instincts should not be neglected. If the rat does not gnaw, his teeth will become inconvenient or injurious to himself, but it is not clear that he deserves any special eulogium merely because he gnaws.

It will be observed that the definition of a scientific man or man of science, says nothing about his manners or morals. We may infer that a man devoted to science would have neither time nor inclination for dissipation or vice; that he would be virtuous either because of being passionless or because of his clear foresight of the consequences of yielding to temptation.

My own experience, however, would indicate that either this inference is not correct or that some supposed scientific men have been wrongly classified as such. How far the possession of a scientific mind and of scientific knowledge compensates, or atones for, ill-breeding or immorality, for surliness, vanity, and petty jealousy, for neglect of wife or children, for uncleanliness, physical and mental, is a question which can only be answered in each individual case; but the mere fact that a man desires knowledge for its own sake appears to me to have little to do with such questions. I would prefer to know whether the man's knowledge and work are of any use to his fellowmen, whether he is the cause of some happiness in others which would not exist without him. And it may be noted that while utility is of small account in the eyes of some eulogists of the man of science, they almost invariably base their claims for his honor and support upon his usefulness.

The precise limit beyond which a scientist should not make money has not yet been precisely determined, but in this vicinity there are some reasons for thinking that the maximum limit is about $5,000 per annum. If there are any members of the Philosophical society of Washington who are making more than this, or who, as the result of careful and scientific introspection, discover in themselves the dawning of a desire to make more than this, they may console themselves with the reflection that the precise ethics and etiquette which should govern their action under such painful circumstances have not yet been formulated. The more they demonstrate their indifference to mere pecuniary considerations, the more creditable it is to them; so much all are agreed upon; but this is nothing new, nor is it specially applicable to scientists. Yet while each may and must settle such questions as regards himself for himself, let him be very cautious and chary about trying to settle them for other people. Denunciations of other men engaged in scientific pursuits on the ground that their motives are not the proper ones, are often based on insufficient or inaccurate knowledge, and seldom, I think, do good.

This is a country and an age of hurry, and there seems to be a desire to rush scientific work as well as other things. One might suppose, from some of the literature on the subject, that the great object is to make discoveries as fast as possible; to get all the mathematical problems worked out; all the chemical combinations made; all the insects and plants properly labelled; all the bones and muscles of every animal figured and described. From the point of view of the man of science there does not seem to be occasion for such haste. Suppose that every living thing were known, figured, and described. Would the naturalist be any happier? Those who wish to make use of the results of scientific investigation of course desire to hasten the work, and when they furnish the means we cannot object to their urgency; moreover, there is certainly no occasion to fear that our stock of that peculiar form of bliss known as ignorance will be soon materially diminished.

From my individual point of view, one of the prominent features in the scientific procession is that part of it which is connected with government work. Our society brings together a large number of scientific men connected with the various departments; some of them original investigators; most of them men whose chief, though not only, pleasure is study. A few of them have important administrative duties, and are brought into close relations with the heads of departments and with congress. Upon men in such positions a double demand is made, and they are subject to criticism from two very different stand-points. On the one hand are the scientists, calling for investigations which shall increase knowledge without special reference to utility, and sometimes asking that employment be given to a particular scientist on the ground that the work to which he wishes to devote himself is of no known use, and therefore will not support him. On the other hand is the demand from the business men's point of view, — that they shall show practical results; that in demands for appropriations from the public funds they shall demonstrate that the use to be made of such appropriations is for the public good, and that their accounts shall show that the money has been properly expended. — 'properly' not merely in the sense of usefully,

but also in the legal sense, — in the sense which was meant by congress in granting the funds. Nay, more, they must consider not only the intentions of congress, but the opinions of the accounting officers of the treasury, the comptroller and auditor, and their clerks, and not rely solely on their own interpretation of the statutes, if they would work to the best advantage, and not have life made a perpetual burden and vexation of spirit.

There is a tendency on the part of business men and lawyers to the belief that scientific men are not good organizers or administrators, and should be kept in leading-strings; that it is unwise to trust them with the expenditure of, or the accounting for, money; and that the precise direction in which they are to investigate should be pointed out to them; in other words, that they should be made problem-solving machines as far as possible.

When we reflect on the number of persons who, like Mark Twain's cat, feel that they are 'nearly lightning on superintending,' on the desire for power and authority, which is almost universal, the tendency to this opinion is not to be wondered at. Moreover, as regards the man of science, there is some reason for it in the very terms by which he is defined, the characteristics for which he is chiefly eulogized.

The typical man of science is, in fact, in many cases an abnormity, just as a great poet, a great painter, or a great musician is apt to be, and this not only in an unusual development of one part of the brain, but in an inferior development in others. True, there are exceptions to this rule, — great and illustrious exceptions; but I think we must admit that the man of science often lacks tact, and is indifferent to and careless about matters which do not concern his special work, and especially about matters of accounts and pecuniary details. If such a man is at the head of a bureau, whose work requires many subordinates and the disbursement of large sums of money, he may consider the business management of his office as a nuisance, and delegate as much of it as possible to some subordinate official, who, after a time, becomes the real head and director of the bureau. Evil results have, however, been very rare, and the recognition of the possibility of their occurrence is by no means an admission that they are a necessity, and still less of the proposition that administrative officers should not be scientific men.

I feel very sure that there are always available scientific men, thoroughly well informed in their several departments, who are also thoroughly good business men, and are as well qualified for administrative work as any. When such men are really wanted, they can always be found, and, as a matter of fact, a goodly number of them have been found, and are now in the government service.

The head of a bureau has great responsibilities; and while his position is, in many respects, a desirable one, it would not be eagerly sought for by most scientific men if its duties were fully understood.

In the first place, the bureau chief must give up a great part of his time to routine hack work. During his business, or office, hours he can do little else than this routine work, partly because of its amount, and partly because of the frequent interruptions to which he is subjected. His visitors are of all kinds, and come from all sorts of motives, — some to pass away half an hour, some to get information, some seeking office. It will not work well if he takes the ground that his time is too important to be wasted on casual callers, and refers them to some assistant.

In the second place, he must, to a great extent at least, give up the pleasure of personal investigation of questions that specially interest him, and turn them over to others. It rarely happens that he can carry out his own plans in his own way, and perhaps it is well that this should be the case. The general character of his work is usually determined for him either by his predecessors, or by congress, or by the general consensus of opinion of scientific men interested in the particular subject or subjects to which it relates. This last has very properly much weight; in fact, it has much more weight than one might suppose, if he judged from some criticisms made upon the work of some of our bureaus whose work is more or less scientific. In these criticisms it is urged that the work has not been properly planned and correlated; that it should not be left within the power of one man to say what should be done; that the plans for work should be prepared by disinterested scientific men, as, for instance, by a committee of the national academy; and that the function of the bureau official should be executive only.

I have seen a good deal of this kind of literature within the last ten or twelve years, and some of the authors of it are very distinguished men in scientific work; yet I venture to question the wisdom of such suggestions. As a rule, the plans for any extended scientific work to be undertaken by a government department are the result of very extended consultations with specialists, and meet with the approval of a majority of them. Were it otherwise, the difficulties in obtaining regular annual appropriations for such work would be great and cumulative, for in a

short time the disapproval of the majority of the scientific public would make itself felt in congress. It is true that the *vis inertiae* of an established bureau is very great. The heads of departments change with each new administration, but the heads of bureaus remain; and if an unfit man succeeds in obtaining one of these positions, it is a matter of great difficulty to displace him; but it seems to me to be wiser to direct the main effort to getting right men in right places rather than to attempt to elaborate a system which shall give good results with inferior men as the executive agents, which attempt is a waste of energy.

You are all familiar with the results of the inquiry which has been made by a congressional committee into the organization and work of certain bureaus which are especially connected with scientific interests, and with the different opinions which this inquiry has brought out from scientific men. I think that the conclusion of the majority of the committee — that the work is, on the whole, being well done, and that the people are getting the worth of their money — is generally assented to. True, some mistakes have been made, some force has been wasted, some officials have not given satisfaction; but is it probable that any other system would give so much better results that it is wise to run the risks of change?

This question brings us to the only definite proposition which has been made in this direction, namely, the proposed department of science, to which all the bureaus whose work is mainly scientific, such as the coast survey, the geological survey, the signal service, the naval observatory, etc., shall be transferred.

The arguments in favor of this are familiar to you, and, as regards one or two of the bureaus, it is probable that the proposed change would effect an improvement; but as to the desirability of centralization and consolidation of scientific interests and scientific work into one department under a single head, I confess that I have serious doubts.

One of the strongest arguments in favor of such consolidation that I have seen is the address of the late president of the Chemical society of Washington, Professor Clarke, 'On the relations of the government to chemistry,' delivered about a year ago. Professor Clarke advises the creation of a large, completely equipped laboratory, planned by chemists and managed by chemists, in which all the chemical researches required by any department of the government shall be made, and the abandonment of individual laboratories in the several bureaus on the ground that these last are small, imperfectly equipped, and not properly specialized; that each chemist in them has too broad a range of duty and receives too small a salary to command the best professional ability. He would have a national laboratory, in which one specialist shall deal only with metals, another with food-products, a third with drugs, etc., while over the whole, directing and correlating their work, shall preside the ideal chemist, the all-round man, recognized as the leader of the chemists of the United States. And so should the country get better and cheaper results. It is an enticing plan, and one which might be extended to many other fields of work. Granting the premises that we shall have the best possible equipment, with the best possible man at the head of it, and a sufficient corps of trained specialists, each of whom will contentedly do his own work as directed and be satisfied, so that there shall be no jealousies, or strikes, or boycotting, and we have made a long stride toward Utopia. But before we centralize in this way we must settle the question of classification. Just as in arranging a large library there are many books which belong in several different sections, so it is in applied science. Is it certain that the examination of food-products or of drugs should be made under the direction of the national chemist rather than under that of the departments which are most interested in the composition and quality of these articles? This does not seem to me to be a self-evident proposition by any means. The opinion of a scientific man as to whether the government should or should not undertake to carry out any particular branch of scientific research and publish the results, whether it should attempt to do such work through officers of the army and navy, or more or less exclusively through persons specially employed for the purpose, whether the scientific work shall be done under the direction of those who wish to use, and care only for, the practical results, or whether the scientific man shall himself be the administrative head and direct the manner in which his results shall be applied, — the opinion of a scientific man on such points, I say, will differ according to the part he expects or desires to take in the work, according to the nature of the work, according to whether he is an army or navy officer or not, according to whether he takes more pleasure in scientific investigations than in administrative problems, and so forth.

It is necessary, therefore, to apply a correction for personal equation to each individual set of opinions before its true weight and value can be estimated, and, unfortunately, no general formula for this purpose has yet been worked out.

I can only indicate my own opinions, which are

those of an army officer, who has all he wants to do, who does not covet any of his neighbors' work or goods, and who does not care to have any more masters than those whom he is at present trying to serve. You see that I give you some of the data for the formula by which you are to correct my statements, but this is all I can do.

I am not inclined at present to urge the creation of a department of science as an independent department of the government having at its head a cabinet officer. Whether such an organization may become expedient in the future seems to me doubtful; but at all events I think the time has not yet come for it.

I do not believe that government should undertake scientific work merely or mainly because it is scientific, or because some useful results may possibly be obtained from it. It should do, or cause to be done, such scientific work as is needful for its own information and guidance when such work cannot be done, or cannot be done so cheaply or conveniently by private enterprise. Some kinds of work it can best have done by private contract, and not by officials; others, by its own officers. To this last class belong those branches of scientific investigation, or the means for promoting them, which require long-continued labor and expenditure on a uniform plan; such as the work of the government observatory, of the government surveys, of the collection of the statistics which are so much needed for legislative guidance, and in which we are at present so deficient, the formation of museums and libraries, and so forth.

Considering the plans and operations of these government institutions from the point of view of the scientific public, it is highly desirable that they should contribute to the advancement of abstract science, as well as to the special practical ends for which they have been instituted; but from the point of view of the legislator, who has the responsibility of granting the funds for their support, the practical results should receive the chief consideration, and therefore they should be the chief consideration on the part of those who are to administer these trusts. It must be borne in mind that while the average legislator is, in many cases, not qualified to judge *a priori* as to what practical results may be expected from a given plan for scientific work, he is, nevertheless, the court which is to decide the question according to the best evidence which he can get, or, rather, which is brought before him, and it is no unimportant part of the duty of those who are experts in these matters to furnish such evidence.

But in saying that practical results should be the chief consideration of the government and of its legislative and administrative agents it is not meant that these should [be the only considerations. In the carrying out of any extensive piece of work which involves the collection of data, experimental inquiry, or the application of scientific results under new conditions, there is more or less opportunity to increase knowledge at the same time and with comparatively little increased cost. Such opportunity should be taken advantage of, and is also a proper subsidiary reason for adopting one plan of work in preference to another, or for selecting for appointment persons qualified not only to do the particular work which is the main object, but also for other allied work of a more purely scientific character.

On the same principle it seems to me proper and expedient that when permanent government employees have at times not enough to do in their own departments, and can be usefully employed in scientific work, it is quite legitimate and proper to thus make use of them. For example, it is desirable that this country should have such an organization of its army and navy as will permit of rapid expansion when the necessity arises, and this requires that more officers shall be educated and kept in the service than are needed for military and naval duty in time of peace. It has been the policy of the government to employ some of these officers in work connected with other departments, and especially in work which requires such special training, scientific or administrative, or both, as such officers possess. To this objections are raised, which may be summed up as follows: —

First, that [such officers ought not to be given positions which would otherwise be filled by civilian scientists, because these places are more needed by the civilians as a means of earning subsistence, and because it tends to increase the competition for places and to lower salaries. But in other words, the argument is that it is injurious to the interests of scientific men, taken as a body, that the government should employ in investigations or work requiring special knowledge and skill men who have been educated and trained at its expense, and who are permanently employed and paid by it. This is analogous to the trades union and the anti-convict labor platforms.

The second objection is that army and navy officers do not, as a rule, possess the scientific and technical knowledge to properly perform duties lying outside of the sphere of the work for which they have been educated, and that they employ as subordinates really skilled scientific men, who make the plans and do most of the work, but do not receive proper credit for it. The reply to this is that it is a question of fact in each particular case, and that if the officer is able to select and

employ good men to prepare the plans and to do the work, this in itself is a very good reason for giving him the duty of such selection and employment.

A third objection is that when an officer of the army or navy is detailed for scientific or other special work, the interests of this work and of the public are too often made subordinate to the interests of the naval or military service, more especially in the matter of change of station. For example, civil engineers object to the policy of placing river and harbor improvements in the hands of army engineers, because one of the objects kept in view by the war department in making details for this purpose is to vary the duty of the individual officer from time to time so as to give him a wider experience. Hence it may happen that an officer placed on duty in connection with the improvement of certain harbors on the Great Lakes shall, after three or four years, and just as he has gained sufficient experience of the peculiarities of lake work to make his supervision there peculiarly valuable, be transferred to work on the improvement of the Lower Mississippi, with which he may be quite unfamiliar.

In like manner Professor Clarke objects to having a laboratory connected with the medical department of the navy on the ground that the officer in charge is changed every three years; consequently science suffers in order that naval routine may be preserved.

There is force in this class of objections, but the moral I should draw from them is, not that army and navy officers should not be allowed to do work outside their own departments or in science, but that when they are put upon such duty, the ordinary routine of change of station every three or four years should not be enforced upon them without careful consideration of the circumstances of the case, and satisfactory evidence that the work on which they are engaged will not suffer by the change. And, as a matter of fact, I believe this has been the policy pursued, and instances could be given where an officer has been kept twenty years at one station for this very reason.

I pass over a number of objections that I have heard made to the employment of army and navy officers as administrators, on the ground that they are too 'bumptious,' or 'domineering,' or 'supercilious,' or 'finicky,' because every one knows what these mean and their force. An army officer is not necessarily a polished gentleman; neither is a civilian; and a good organizer and administrator, whether officer or civilian, will at times, and especially to some people, appear arbitrary and dictatorial.

There is another objection to special details of army or navy officers for scientific duties which comes not so much from outside persons as from the war department and the officers themselves, and it is this: among such officers there are always a certain number who not only prefer special details to routine duty, but who actively seek for such details, who are perpetual candidates for them.

The proportion of men whose ideas as to their own scientific acquirements, merits, and claims to attention, are excessive as compared with the ideas of their acquaintances on the same points, is not greater in the army than elsewhere; but when an army officer is afflicted in this way, the attack is sometimes very severe, and the so-called influence which he brings to bear may cause a good deal of annoyance to the department, even if it be not sufficient to obtain his ends. I have heard officers of high rank, in a fit of impatience under such circumstances, express a most hearty and emphatic wish that no special details were possible, so that lobbying for them should be useless. This, however, seems to me to be too heroic a remedy for the disease, which, after all, only produces comparatively trifling irritation and discomfort.

The same evil exists, to a much greater extent, in the civil branches of the government. Few persons can fully appreciate the loss of time, the worry, and the annoyance to which the responsible heads of some of our bureaus for scientific work are subjected through the desire of people for official position and for maintenance by the government. They have to stand always at the bat and protect their wickets from the balls which are bowled at them in every direction, even from behind by some of their own subordinates.

It is true that a great majority of the balls go wide and cause little trouble, and a majority of the bowlers soon get tired and leave the field; but there are generally a few persistent ones who gradually acquire no small degree of skill in discovering the weak or unguarded points, and succeed in making things lively for a time. Considered from the point of view of the public interests, such men are useful, for although they cause some loss of valuable time, and occasionally do a little damage by promoting hostile legislation, yet their criticisms are often worth taking into account; they tend to prevent the machine from getting into a rut, and they promote activity and attention to business on the part of administrative chiefs. It is a saying among dog-fanciers that a few fleas on a dog are good for him rather than otherwise, as they compel him to take some exercise under any circumstances.

At all events, I think it very doubtful whether the jealousies and desire for position for one's self or one's friends which exist under present circumstances would be materially diminished under any other form of organization, even under a department of science.

Some conflict of interests now exists, it is true; some work is duplicated; but neither the conflict nor the duplication are necessarily wholly evil in themselves, nor in so far as they are evil are they necessary parts of the present system. This system is of the nature of a growth: it is organic, and not a mere pudding-stone aggregation of heterogeneous materials, and the wise course is to correct improper bendings and twistings gradually, prune judiciously, and go slow in trying to secure radical changes lest death or permanent deformity result.

It will be seen that in what I have said I have not attempted to eulogize science or scientists in the abstract. I should be very sorry, however, to have given any one the impression that I think they should not be eulogized. Having read a number of eloquent tributes to their importance by way of inducing a proper frame of mind in which to prepare this address, it is possible that I overdid it a little, and was in a sort of reaction stage when I began to write. But the more I have thought on the subject, and the more carefully I have sought to analyze the motives and character of those of my acquaintances who are either engaged in scientific work or who wish to be considered as so doing, and to compare them with those who have no pretensions to science, and who make none, the more I have been convinced that upon the whole the eulogium is the proper thing to give, and that it is not wise to be critical as to the true inwardness of all that we see or hear.

At least nine-tenths of the praises which have been heaped upon scientific men as a body are thoroughly well deserved. Among them are to be found a very large proportion of true gentlemen, larger, I think, than is to be found in any other class of men, — men characterized by modesty, unselfishness, scrupulous honesty, and truthfulness, and by the full performance of their family and social duties.

Even their foibles may be likable. A little vanity or thirst for publicity, zeal in claiming priority of discovery, or undue wrath over the other scientist's theory, does not and should not detract from the esteem in which we hold them. A very good way of viewing characteristics which we do not like is to bear in mind that different parts of the brain have different functions; that all of them cannot act at once, and that their tendencies are sometimes contradictory.

There are times when a scientific man does not think scientifically, when he does not want to so think, and possibly when it is best that he should not so think. There is wisdom in Sam. Lawson's remark that "folks that are always telling you what they don't believe are sort o' stringy and dry. There ain't no 'sorption got out o' not believing nothing." At one time the emotional, at another the intellectual, side of the scientific man has the ascendency, and one must appeal from one state to the other. Were scientific thinking rigorously carried out to practical results in everyday life, there would be some very remarkable social changes, and perhaps some very disagreeable ones.

That scientific pursuits give great pleasure without reference to their utility, or to the fame or profit to be derived from them, that they tend to make a man good company to himself and to bring him into pleasant associations, is certain; and that a man's own pleasure and happiness are things to be sought for in his work and companionship is also certain. If in this address I have ventured to hint that this may not be the only, nor even the most important, object in life, — that one may be a scientific man, or even a man of science, and yet not be worthy of special reverence because he may be at the same time an intensely selfish man, and even a vicious man, — I hope that it is clearly understood that it is with no intention of depreciating the glory of science, or the honor which is due to the large number of scientific gentlemen whom I see around me. A scientific gentleman! All praise to him who merits this title: it is the blue ribbon of our day.

We live in a fortunate time and place, — in the early manhood of a mighty nation, and in its capital city, which every year makes more beautiful, and richer in the treasures of science, literature, and art, which all the keels of the sea and the iron roads of the land are bringing to it. Life implies death; growth presages decay; but we have good reasons for hoping that for our country and our people the evil days are yet far off. Yet we may not rest and eat lotus; we may not devote our lives to our own pleasure, even though it be pleasure derived from scientific investigation. No man lives for himself alone: the scientific man should do so, least of all. There never was a time when the world had more need of him, and there never was a time when more care was needful lest his torch should prove a firebrand and destroy more than it illuminates.

The old creeds are quivering; shifting; changing like the colored flames on the surface of the Bessemer crucible. They are being analyzed, and accounted for, and toned down, and explained,

until many are doubting whether there is any solid substratum beneath: but the instinct which gave those creeds their influence is unchanged.

The religions and philosophies of the orient seem to have little in common with modern science. The sage of the east did not try to climb the ladder of knowledge step by step. He sought a wisdom which he supposed far superior to all knowledge of earthly phenomena obtainable through the senses. The man of science of the west seeks knowledge by gradual accumulation, striving by comparison and experiment to eliminate the errors of individual observations, and doubting the possibility of attaining wisdom in any other way. The knowledge which he has, or seeks, is knowledge which may be acquired partly by individual effort and partly by co-operation, which requires material resources for its development, the search for which may be organized and pursued through the help of others, which is analogous in some respects to property which may be used for power or pleasure. The theologian and the poet claim that there is a wisdom which is not acquired, but attained to, which cannot be communicated or received at pleasure, which comes in a way vaguely expressed by the words 'intuition,' or 'inspiration,' which acts through and upon the emotional rather than the intellectual faculties, and which, thus acting, is sometimes of irresistible power in exciting and directing the actions of individuals and of communities.

The answer of the modern biologist to the old Hebrew question, viz., "Why are children born with their hands clinched, while men die with their hands wide open?" would not in the least resemble that given by the rabbis; yet this last it is well that the scientist should also remember: "Because on entering the world men would grasp every thing, but on leaving it all slips away." There exist in men certain mental phenomena, the study of which is included in what is known as ethics, and which are usually assumed to depend upon what is called moral law. Whether there is such a law, and whether, if it exists, it can be logically deduced from observed facts in nature or is only known as a special revelation, are questions upon which scientific men in their present stage of development are not agreed. There is not yet any satisfactory scientific basis for what is recognized as sound ethics and morality throughout the civilized world: these rest upon another foundation.

This procession, bearing its lights of all kinds, smoky torches, clear-burning lamps, farthing rushlights, and sputtering brimstone matches, passes through the few centuries of which we have a record, illuminating an area which varies, but which has been growing steadily larger. The individual members of the procession come from, and pass into, shadow and darkness, but the light of the stream remains. Yet it does not seem so much darkness, an infinite night, whence we come and whither we go, as a fog which at a little distance obscures or hides all things, but which, nevertheless, gives the impression that there is light beyond and above it. In this fog we are living and groping, stumbling down blind alleys, only to find that there is no thoroughfare, getting lost and circling about on our own tracks as on a *jumbie* prairie; but slowly and irregularly we do seem to be getting on, and to be establishing some points in the survey of the continent of our own ignorance.

In some directions the man of science claims to lead the way; in others, the artist, the poet, the devotee. Far-reaching as the speculations of the man of science may be, ranging from the constitution and nature of a universal protyle, through the building of a universe to its resolution again into primal matter or modes of motion, he can frame no hypothesis which shall explain consciousness, nor has he any data for a formula which shall tell what becomes of the individual when he disappears in the all-surrounding mist. Does he go on seeking and learning in other ways or other worlds? The great mass of mankind think that they have some information bearing on these questions: but, if so, it is a part of the wisdom of the orient, and not of the physical or natural science of the occident. Whether after death there shall come increase of knowledge, with increase of desires and of means of satisfying them, or whether there shall be freedom from all desire, and an end of coming and going, we do not know; nor is there any reason to suppose that it is a part of the plan of the universe that we should know. We do know that the great majority of men think that there are such things as right and duty, — God and a future life, — and that to each man there comes the opportunity of doing something which he and others recognize to be his duty. The scientific explanation of a part of the process by which this has been brought about, as by natural selection, heredity, education, progressive changes in this or that particular mass of brain matter, has not much bearing on the practical question of 'What to do about it?' But it does, nevertheless, indicate that it is not a characteristic to be denounced, or opposed, or neglected, since, even in the 'struggle-for-existence' theory, it has been, and still is, of immense importance in human social development.

"Four men," says the Talmud, "entered Para-

dise. One beheld and died. One beheld and lost his senses. One destroyed the young plants. One only entered in peace and came out in peace." Many are the mystic and cabalistic interpretations which have been given of this saying; and if for 'Paradise' we read the 'world of knowledge,' each of you can no doubt best interpret the parable for himself. Speaking to a body of scientific men, each of whom has, I hope, also certain unscientific beliefs, desires, hopes, and longings, I will only say, 'Be strong and of a good courage.' As scientific men, let us try to increase and diffuse knowledge; as men and citizens, let us try to be useful; and, in each capacity, let us do the work that comes to us honestly and thoroughly, and fear not the unknown future.

When we examine that wonderful series of wave-marks which we call the spectrum, we find, as we go downwards, that the vibrations become slower, the dark bands wider, until at last we reach a point where there seems to be no more movement; the blackness is continuous, the ray seems dead. Yet within this year Langley has found that a very long way lower down the pulsations again appear, and form, as it were, another spectrum; they never really ceased, but only changed in rhythm, requiring new apparatus or new senses to appreciate them. And it may well be that our human life is only the lower spectrum, and that beyond and above the broad black band which we call death there are other modes of impulses, — another spectrum which registers the ceaseless beats of waves from the great central fountain of force, the heart of the universe, in modes of existence of which we can but dimly dream.

CLARK'S PHILOSOPHY OF WEALTH.

'A REMARKABLE book!' Such is my involuntary exclamation as I finish reading Professor Clark's book, 'The philosophy of wealth.' In reviewing it I suffer in several ways under an 'embarrassment of riches.' There are so many excellent features of the work that it is difficult to select one or two for treatment, and there are so many passages in my copy marked for quotation that they would occupy far more space than can be given to the entire review. It seems, under the circumstances, best to abandon any idea of an exhaustive treatment of this admirable book, and simply attempt to notice a few of its characteristics in the hope that many may be induced to confer a benefit on themselves by its perusal.

The philosophy of wealth. By J. B. CLARK. Boston, *Ginn*, 1886. 12°.

'The philosophy of wealth' is a treatment of fundamental principles in economics, in which every page is luminous with clear analysis and profound thought. Yet the entire work is most practical, and should attract the attention of all interested in the problems of the day; for nothing is more needed at the present time than deeper knowledge. People lose themselves in a maze of stock-phrases, and continue to move in the same weary circle because they fail to grasp primary principles.

Professor Clark very properly lays emphasis on this point in his first chapter. He says, "If obscurity still hangs over principles, the clear apprehension of which is essential to all reasoning on the subject, the removal of it, besides having an incalculable value in itself, will afford a welcome supplement to directly practical work. It will shed light on the pressing social questions of the day. In the present state of the public mind, for example, financial heresies and strange teachings concerning the rights of property find a ready circulation; and if these false doctrines connect themselves, even remotely, with fundamental errors of political economy, then the assault upon the practical fallacies can never be quite successful until the underlying errors be exposed and corrected. Questions on the solution of which the general prosperity depends cannot be solved without the clear apprehension of correct principles."

The scope of the work may most readily be gathered from the titles of the chapters, which are the following: Wealth; Labor and its relation to wealth; The basis of economic law; The elements of social service; The theory of value; The law of demand and supply; The law of distribution; Wages as affected by combinations; The ethics of trade; The principles of co-operation; Non-competitive economics; The economic function of the church.

One of the best examples of clear analysis of economic phenomena is found in the discussion of utilities. There is first a distinction between absolute and effective utility, which explains satisfactorily the apparent contradiction, found in old treatises, between high value in use and low value in exchange. Water is said to be useful, for example, but to have no value. The logical ambiguity lies in this: when we say water is more useful than diamonds, we think of water in the abstract; when we say water has no value, we think of a definite concrete amount of water, a glassful for example. But that has also very little use. If my glass is upset, I do not grieve: I have no special attachment to that particular concrete water, and I get some more without difficulty.

This is explained more clearly by Professor Clark than by any other writer in English.

Utilities are further subdivided, and a different law of costliness is found to govern elementary utilities from that which obtains with respect to form and place utilities. The law of diminishing returns holds only for elementary utilities. This has an important bearing on Malthusianism, for a predominance is demonstrated of those utilities which tend to cheapness. At the same time the essence of Malthusianism is recognized and admirably stated in these words: It "maintains that a retarding of the rate of increase of population is an ultimate necessity, if humanity is to fully enjoy the earth and to perfect itself." This is a great improvement on any thing which can be found in previous writers, and ought to modify the teaching of political economy. Other points which must especially interest the professional economist are the theory of non-competing groups and the treatment of non-competitive economics, which show conclusively the existence of narrower limits to the range of competitive action than is ordinarily supposed.

The chapter on non-competitive economics is in some respects as important as any in the book. It demonstrates the fact that the field of non-competitive economics is increasing; that it ought, in the interest of humanity, to be still further widened; and that even now the highest forms of rational wealth are disbursed non-competitively.

The book abounds in valuable practical suggestions; but the man of affairs will be chiefly interested in the chapters on combinations, the ethics of trade, and the economic functions of the church. The last-named subject is discussed more profoundly than in any other book which has come under my notice, and the root of the matter is touched in the protest against the appeal in the forms of church activity to the spirit of caste. The author does not hesitate to call things by their proper names, and throughout he reveals a vigor of treatment equal to the strength of moral purpose everywhere displayed.

More, perhaps, might have been said about the nature of economic laws, which is to most economists even a dark field: and possibly the terms 'induction' and 'deduction' should have been more clearly defined. A great deal of current discussion on economic method leaves the painful impression of sad ignorance in the fundamental principles of logic as understood at present.

I cannot either express unqualified approval of what is said in regard to railways. I do not believe, as the result of my studies, that experience has so far pronounced in favor of government control rather than ownership of means of communication and transportation; and, if that alternative be accepted, Professor Clark fails to show the possibility of an exercise of control over such powerful economic factors. Experience has never demonstrated it. However, this is a subject which needs much further discussion by non-partisans whose sole purpose is the public weal; and I close this notice of Professor Clark's book with the unhesitating assertion that it is one of the most important contributions to economics ever made by an American.

RICHARD T. ELY.

PLANT-DISSECTION.

Handbook of plant-dissection. By J. C. ARTHUR, C. R. BARNES, and J. M. COULTER. New York, *Holt*, 1886. 8°.

THIS book is a useful guide to the study of a dozen plants of common occurrence, ranging from the most simple forms to those of highest organization. It is modelled on Huxley and Martin's 'Elementary biology,' physiological details being, however, omitted. The introduction gives brief instructions as to the instruments and materials to be used, including the simple lens and compound microscope; the chemical reagents employed; section-cutting and the mounting and drawing of objects; and a list of books of reference needed. The gross anatomy of the plant is first studied with the aid of a hand-lens only, and subsequently its minute anatomy explored with the compound microscope. Outlines are given for the complete study of the following forms: Protococcus viridis, Oscillaria (more usually written Oscillatoria) tenuis, Spirogyra quinina, Cystopus candidus, Microsphaera Friesii, Marchantia polymorpha, Atrichum undulatum, Adiantum pedatum, Pinus sylvestris, Avena sativa, Trillium recurvatum, and Capsella Bursa-pastoris. It would have been a little more convenient for the average student if one of our native pines had been selected instead of the Scotch pine, though this is quite commonly cultivated; and Trillium recurvatum is of rare occurrence in the eastern states, though for any other purpose save the study of its gross anatomy, any other species of wake-robin will answer as well. A useful glossary of terms used, and an index, are appended.

A REVOLVING pneumatic cannon, devised by a Washington inventor, is one of the most recent additions to the list of destructive weapons. Another recently invented device of a similar nature is an accelerating projectile, which is so constructed that a series of charges, contained in chambers attached to the rear of the projectile, are exploded in succession, at distinct intervals, as the projectile passes along the tube of the cannon.